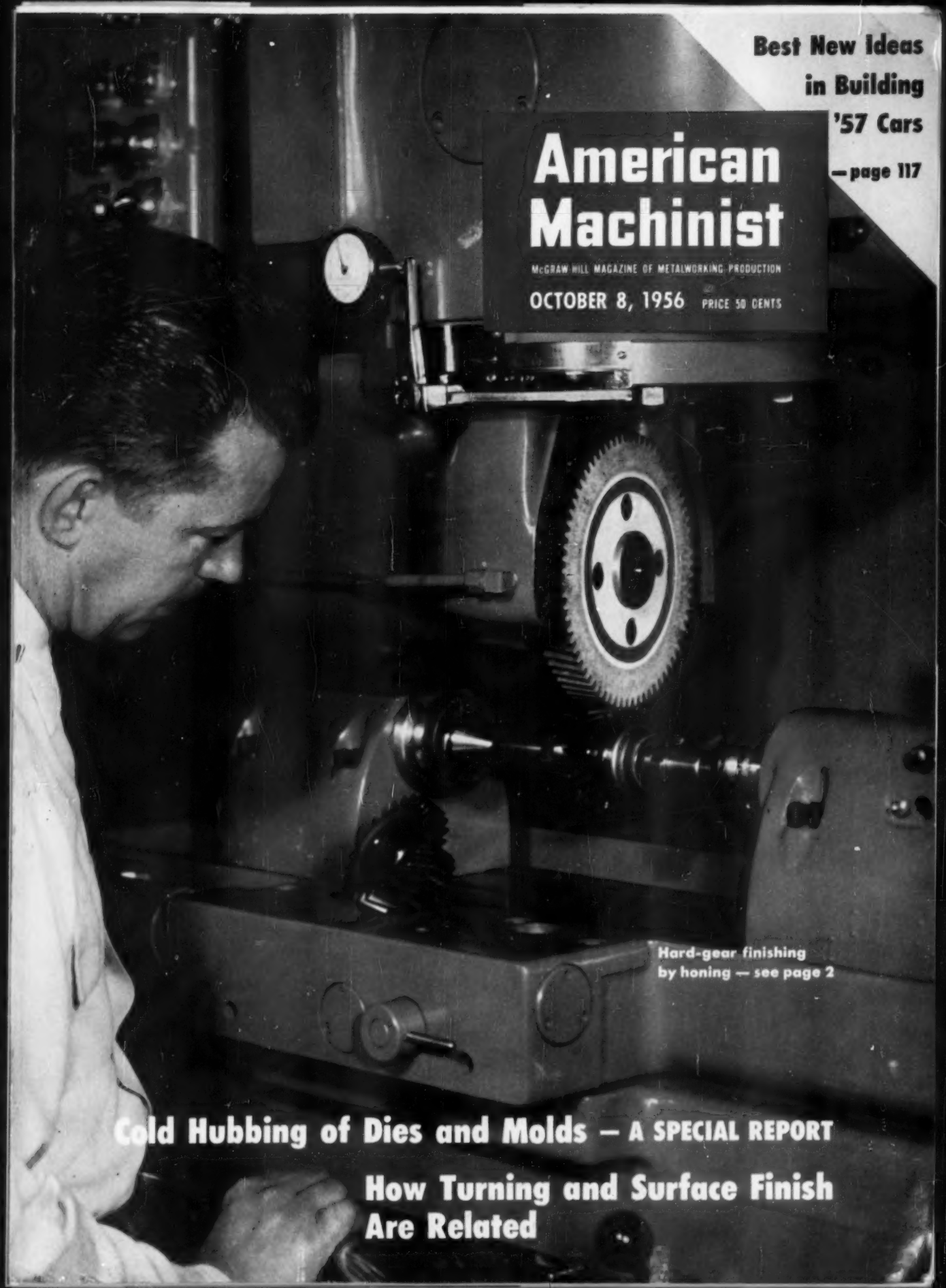


American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

OCTOBER 8, 1956 PRICE 50 CENTS

Best New Ideas in Building '57 Cars

—page 117

Hard-gear finishing by honing — see page 2

Cold Hubbing of Dies and Molds — A SPECIAL REPORT

How Turning and Surface Finish Are Related

AUTOMATION SIMPLIFIED

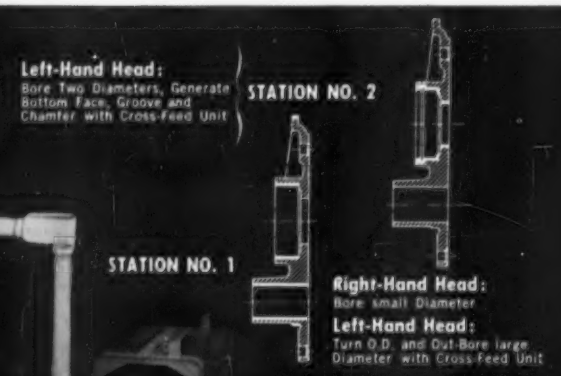
Two-Station Automated Multi-Unit Bore-Matic precision finishes 8 different surfaces at 140 parts per hour

The versatility of Heald Borizing, and the ability to perform several different operations simultaneously at a single station can contribute to the simplicity and economy of an automated production line.

The Multi-Unit Bore-Matic shown here, for example, can do in just two work stations what might otherwise have required more machines and a more extensive workhandling system. In this simple setup, cast iron pump covers are bored, turned, faced, grooved and chamfered at 140 parts per hour at 75% efficiency. Two parts are Borized simultaneously at each station and all operations except initial loading and final unloading are fully automatic.

For Automation that pays its own way . . .

IT PAYS TO COME TO HEALD


Left-Hand Head:
Bore Two Diameters, Generate Bottom Face, Groove and Chamfer with Cross-Feed Unit
STATION NO. 2
STATION NO. 1
Right-Hand Head:
Bore small Diameter
Left-Hand Head:
Turn O.D. and Out-Bore large Diameter with Cross-Feed Unit

HEALD

THE **HEALD** MACHINE COMPANY

Worcester 6, Massachusetts

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McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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How to figure hubbing pressure and cost . . . Here at last are facts on how to determine pressure for cold hubbing, and examples showing how to compare costs with machined cavities. *By John H Hayes, Rockwell Machine Tool Co, London* **149**

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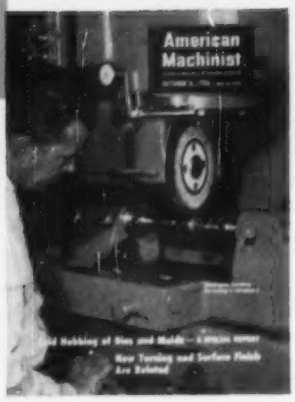
American Machinist *Chips*



Cover . . .
Honing principles are applied to finishing of hardened gear teeth in new Red Ring machine. For full story on the machine see page 184.

Billion dollar gamble . . . Most eyes are on Detroit these days, and with good reason. We have known for months that most of the cars were going to get new bodies and engines, that the rest would have far more than simple "face-lifts" for '57. And we reported as long ago as last March (*AM*—Mar 12 '56 p141) that the industry would spend a billion dollars on the tools, equipment, and facilities to make these changes.

What you want to know, we think, even more than you want to know how the new cars will look or how many will be sold, are the details on the new principles and ideas developed to make them. Somewhere in that billion-dollar investment may be the idea that will be worth a lot to you.

How do you report a billion-dollar program? We tackled that problem months ago, with Burnham Finney drafting the basic plan. First of all, we decided to concentrate on the "little picture." The big, automated transfer lines have been described so often in recent years, by us and by others, that we felt you would benefit more from a collection of top-notch ideas that are more likely to be useful to everyone.

A familiar sight in the auto plants this summer was the graying thatch of our Detroit editor, George De Groat. In Detroit, in Flint, in Dearborn, in Lansing, in Cleveland, in Sandusky, in many other plants, he would be found in close conversation with master mechanics, tool engineers, and superintendents. By the time model changes began, he was ready.

When a new idea went into production, George was there with notebook and photographer. By now he knew where to go and what to look for—and when. As fast as an idea was reported and checked it went off to New York. Here we began assembling them. You'll find the first of a series of reports on the best of this billion-dollar program starting on page 117. George reports he is a little grayer and Andy Ashburn is a little green at the telephone bill he ran up during the late-evening hours (the only time George wasn't hopping from plant-to-plant), but we are all rather proud of the result. Partly because it sets a record for fast reporting (you see some of these even before the cars on which they are being used have been officially introduced), but primarily because we think this plant-by-plant series of top ideas sets a new standard of being useful to you.

Coming . . . *AM* for October 22 will include the second part of the series on "New Techniques Build '57 Cars." There'll also be articles on an unusual turning setup, bending co-axial tubing, grinding stress, transfer molding, inspection, and other subjects.

John H Hayes . . . was educated at Herder Grammar School in Leipzig, and Harrow and Hendon Technical Colleges in London. Practical training was in Leipzig and London. Later he went into toolroom and production management and press tool and machine design with Lamp Presscaps Ltd, part of the Thorn Electrical Industries group. In 1949, Mr Hayes joined the Rockwell Machine Tool Co, Ltd, London, where he has developed automated press lines and cold-hubbing installations. From the latter experience he writes our Special Report.

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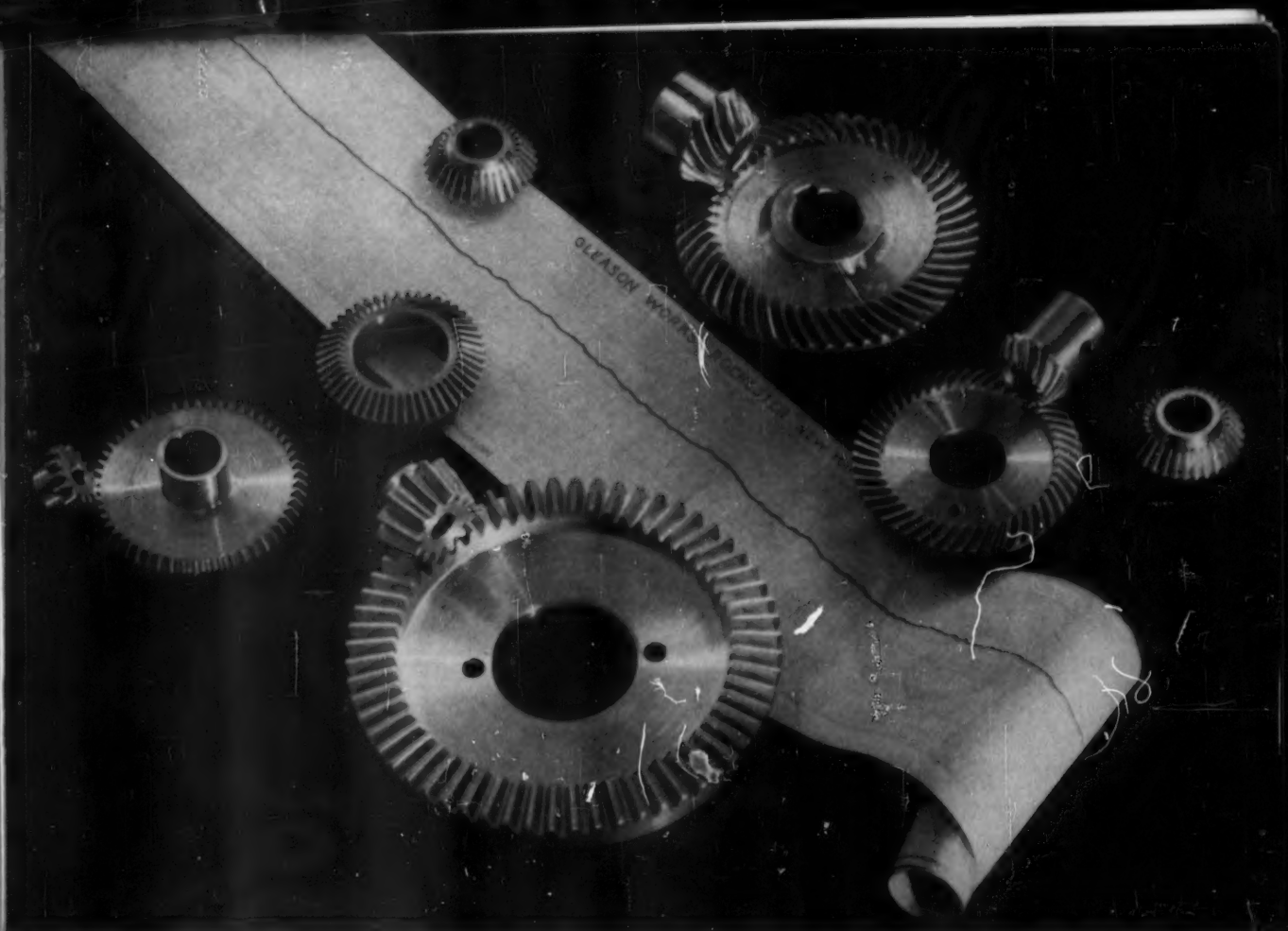

For *the best* in fine pitch gearing . . .

Gleason Works now offers complete production and testing facilities for *any* fine pitch spiral bevel, hypoid, Zerol® or Coniflex® gears.

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Automatic table feed cycles available for plain and vertical machines

Want more information? Look in Sweet's Machine Tool File for brief specifications; complete data in catalog No. M-1915.

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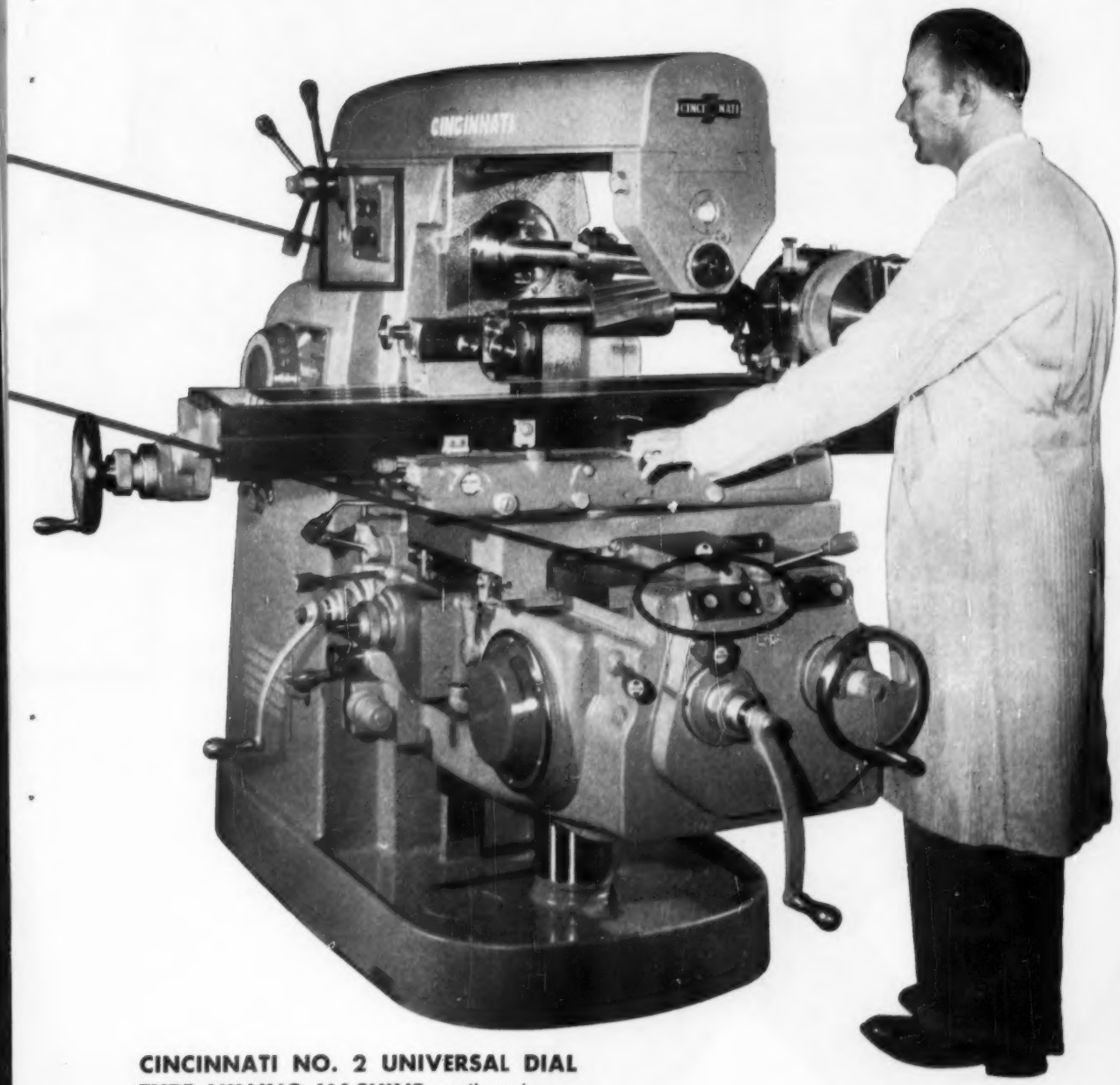
MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • METAL FORMING MACHINES

Push Button Convenience for Spindle Speed Selection



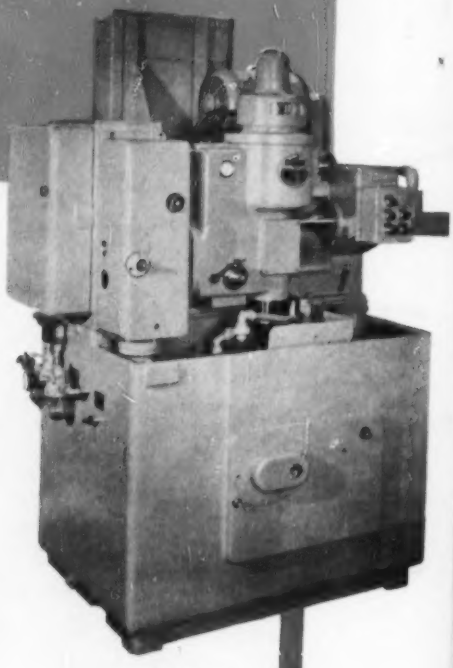
CINCINNATI NO. 2 UNIVERSAL DIAL TYPE MILLING MACHINE easily takes a heavy helical milling cut.

HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

HIGH-PRODUCTION TEAM . . . . . .

Fellows 36-Type Gear Shaper:

produces gears up to 36" p.d., 6" face width.



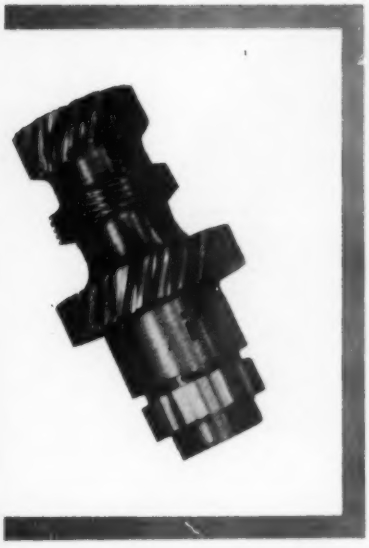
Fellows No. 4 GS Gear Shaper:

produces gears up to 6" p.d., 2" face width.

THE PRECISION LINE

. to meet your gear-cutting needs

. . . up to 36" p.d.



With these two high-speed, close-tolerance machines you can cover the whole range of your spur and helical gear production requirements . . . offering maximum capacity at a reasonable investment.

The new Fellows No. 4GS Gear Shaper finish-cuts internal and external spur and helical gears up to 6" p.d. and 2" face width, at 9 cutter speeds from 98 to 635 strokes per minute! It can be used for general purpose gear cutting or adapted to semi-automatic or completely automatic operation for large production runs. Rigid mechanism assures high speed with close tolerances. Rotary feeds from 0.008" to 0.028" based on 4" p.d. cutter

The Fellows 36-Type is a powerful machine that can hold close tolerances while taking extra heavy cuts on internal or external spur, helical, or herringbone gears up to 36" p.d. and 6" face width. Cutting speeds from 18 to 300 strokes per minute. Matched to modern needs for fast set-ups and quick, easy adjustments. Versatility permits wide-spread use cutting cams, splines, and special contours, too.

Get full information about this profitable team from your Fellows representative. And ask him about the Fellows Plan for deferred payment. WRITE, WIRE or PHONE any Fellows Office.

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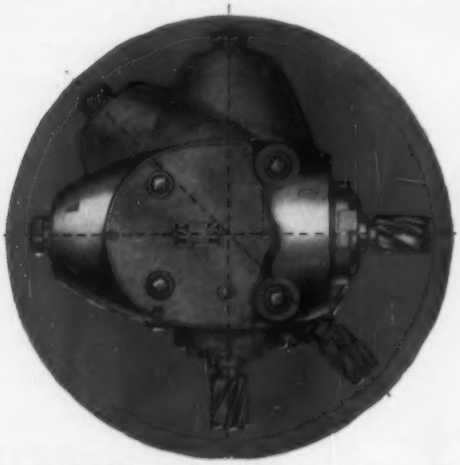
Fellows *Gear Production Equipment*

VAN NORMAN Ram Type Millers

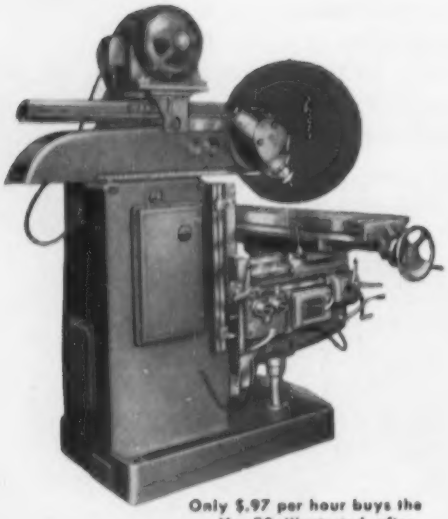
DO THE WORK OF

TWO SINGLE PURPOSE MACHINES

...PLUS *Angular* Milling without Attachments



The adjustable cutterhead gives you two millers in one. Enables you to do horizontal, angular or vertical milling. It eliminates idle machine time . . . helps you increase production . . . cut costs.



Only $.97 per hour buys the No. 28, illustrated, after minimum down payment on 5-year-conditional sales contract.*

No matter what your milling requirement, you simply can't beat Van Norman Ram Type Millers for getting out more pieces per worker-hour, per shift.

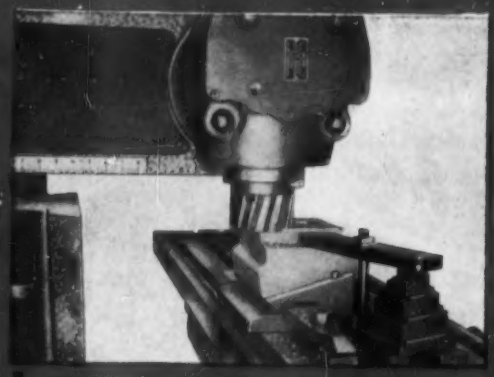
So why invest in two single purpose machines and attachments when *One* Van Norman Miller does the work of two, plus angular milling without attachments?

Write for complete details, now.

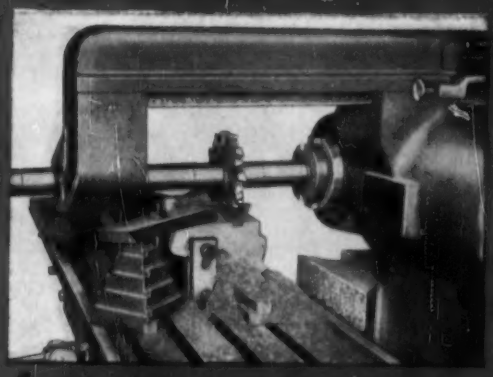
Don't wait . . . for extra profits install a Van Norman Machine Now!
They are available on many purchase plans — Outright sale . . .
Purchase on conditional sales contract up to 5 years . . .
Pay as you depreciate . . . See your dealer or write
Van Norman Company. Conditional Sales Contracts not available to Export.

VAN NORMAN MACHINE

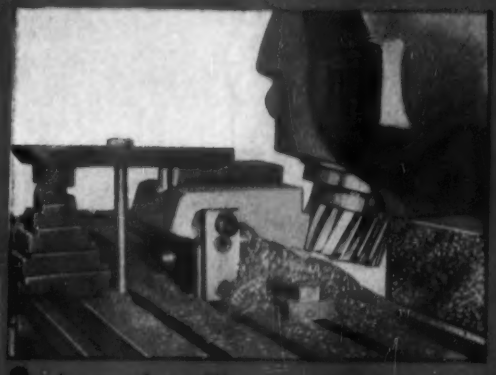
MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.



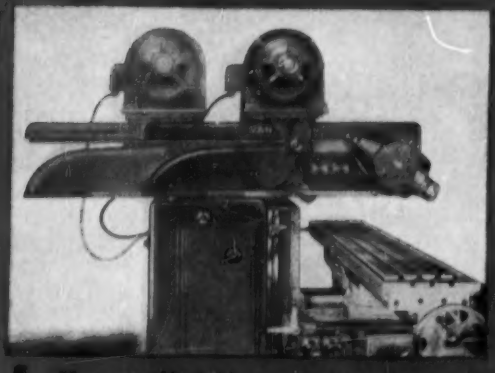
1. With the cutterhead locked in the vertical position, a milling operation is performed on the workpiece.



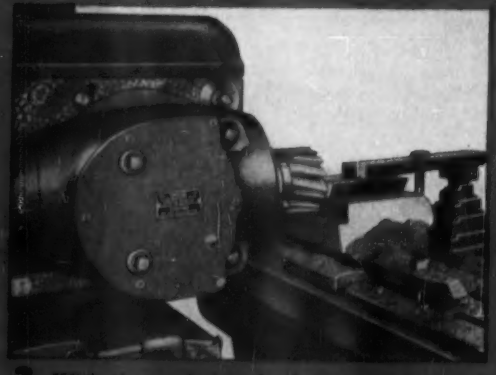
4. With the cutterhead in horizontal position, a slot is milled in the same workpiece. Overarm and outer brace provide maximum rigidity. Note work position has not been changed.



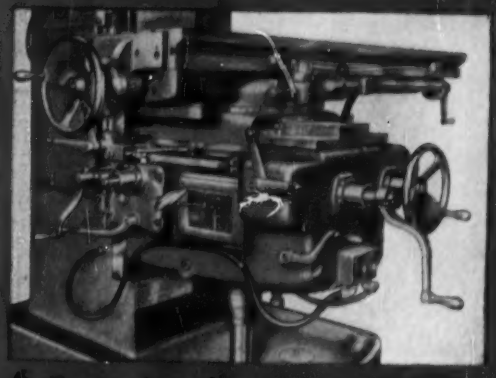
2. An angular milling operation being performed on the same workpiece . . . angular range of cutterhead is 0 degrees to 90 degrees. Note the workpiece is still in the same position.



5. Heavy adjustable ram increases work range . . . permits maximum cuts to the full capacity of the motor. Ram movement 29". Ram scale makes positioning easy.



3. With the workpiece in the same set-up and the cutterhead in horizontal position, two square faces are milled in the work. Note the workpiece set-up has not been changed.



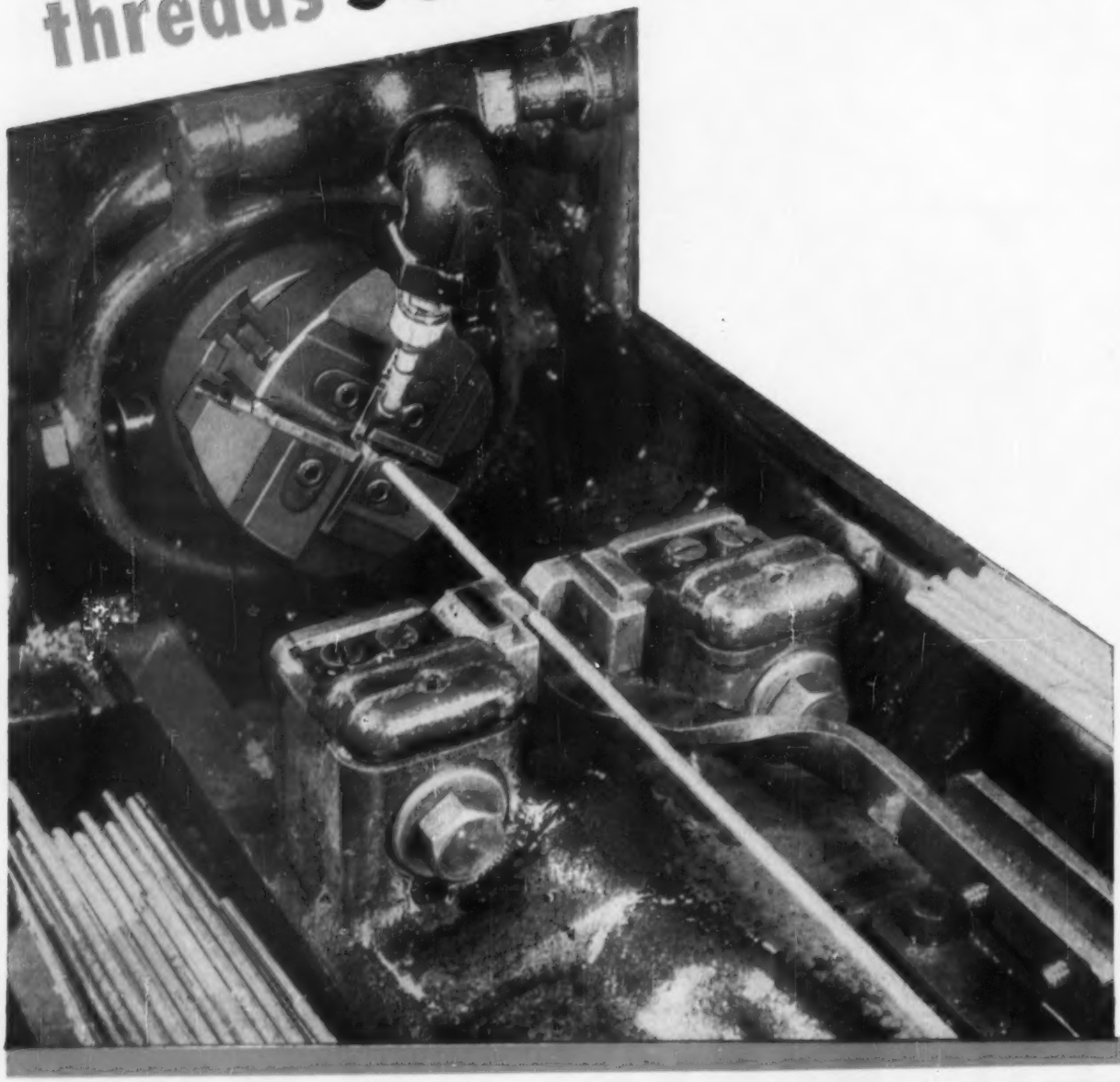
6. Front and rear directional controls simplify operation. This dual control saves time and reduces worker fatigue. Exclusive Van Norman single lever feed selector permits quick, easy

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

1 3/8" Machine

threads 500 pieces per hour



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A LANDIS 3/8" Threading Machine has increased the output of threaded automobile seat lock rods by 25%.

#10 24-pitch UN threads are cut 1¾" long on 54" galvanized wire rods. Production now averages about 500 pieces per hour, with 4,500 pieces threaded between grinds of the chasers. With excellent production between chaser grinds, low tool cost and minimum downtime are assured through the use of long-life LANDIS Tangential Chasers which can be reground for 80% of their original length.

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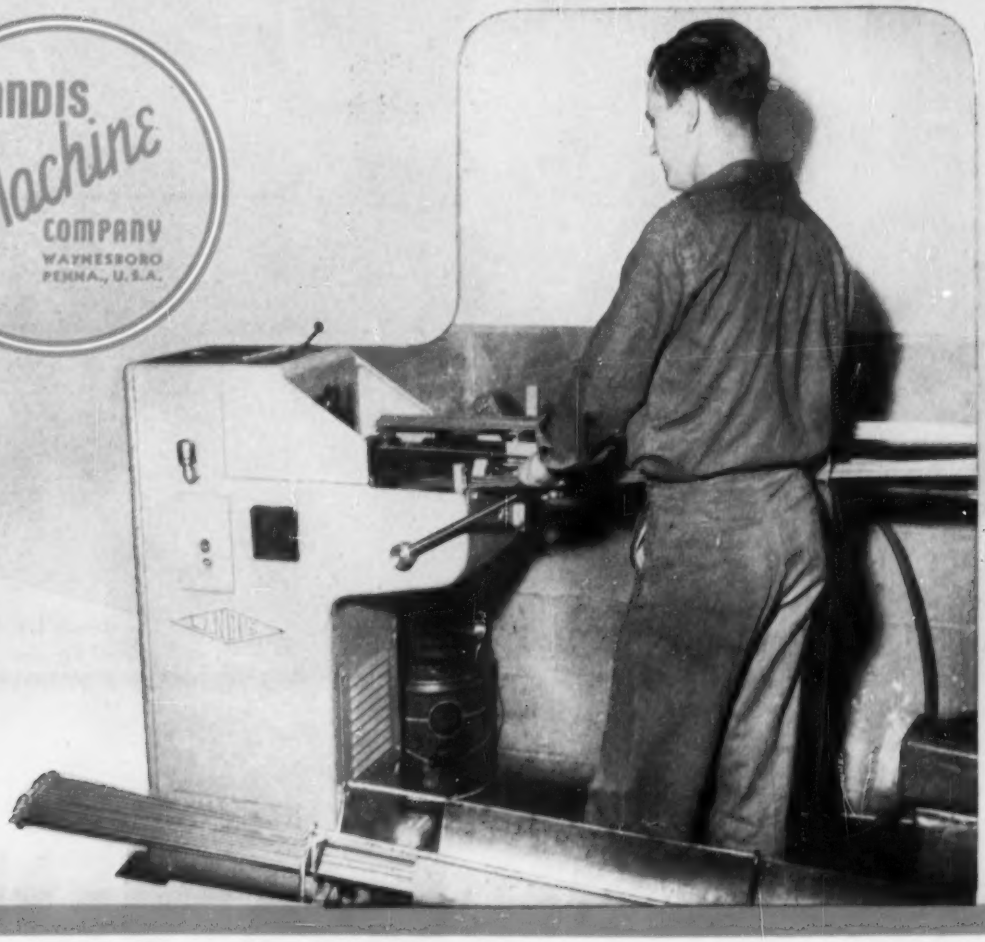
The 3/8" Machine is a small high-speed machine for threading small parts (3/16" to 1/2" in diameter) to precision tolerances. This machine has been designed so that it can be operated with only one hand, freeing the other hand for loading and unloading the workpiece. The opening and closing of the grips is automatically controlled by the carriage operating lever, and the die head automatically opens on completion of the thread and closes during the carriage return.

Analyze the threading operations in your plant today for the possibility of a similar production saving. Then send us the specifications of the workpiece involved, and ask for Bulletin H-91 for more detailed information about the LANDIS 3/8" High Speed Threading Machine.

LANDIS Machine COMPANY
WAYNESBORO
PENNA., U.S.A.



CUTTING - TAPPING - GRINDING - ROLLING

Stationary and solidly supported work

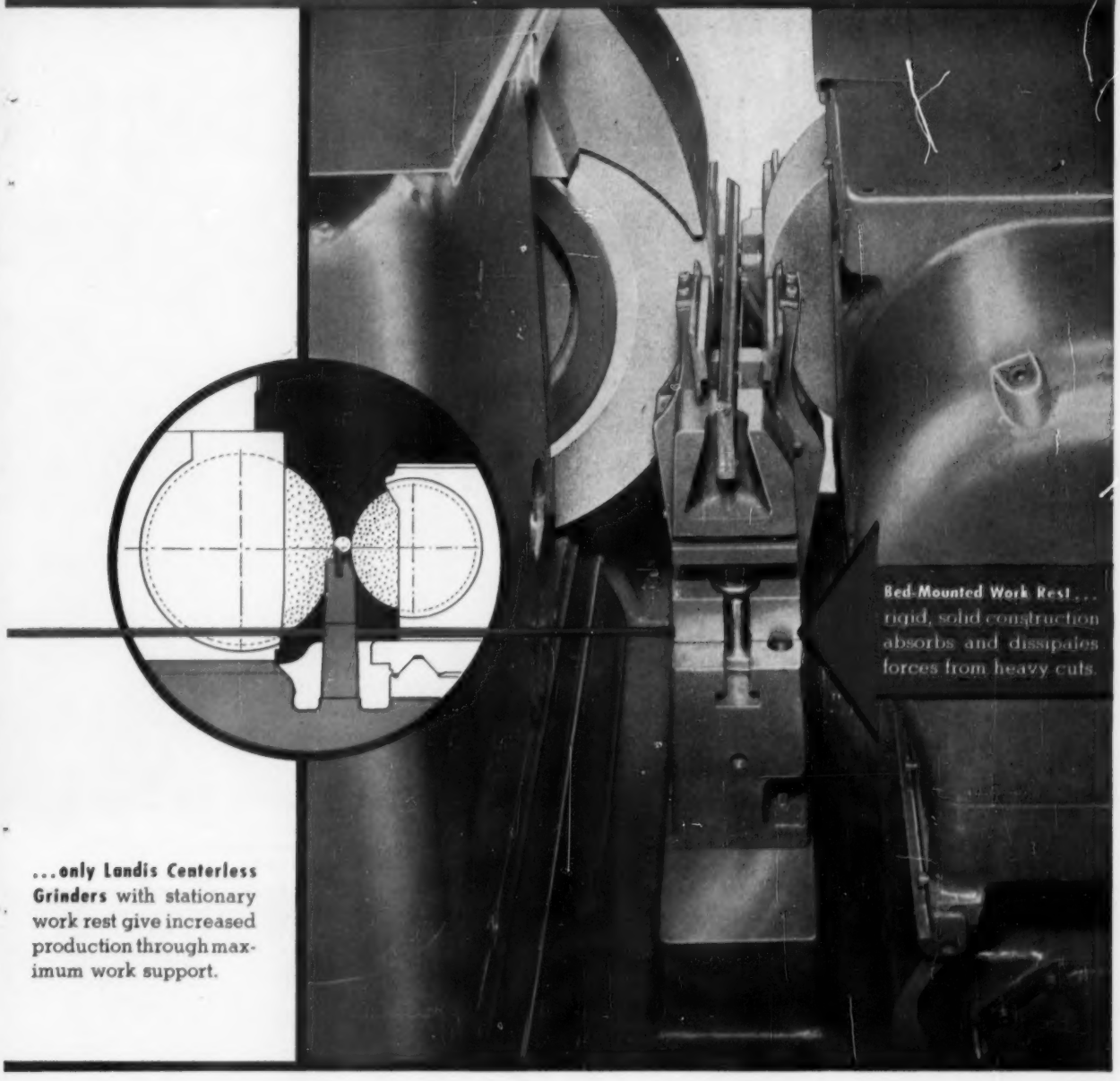
Gives finer finishes, greater precision with heavy cuts

Landis No. 12 Centerless
Send for new catalog T-55

LANDIS

precision grinders

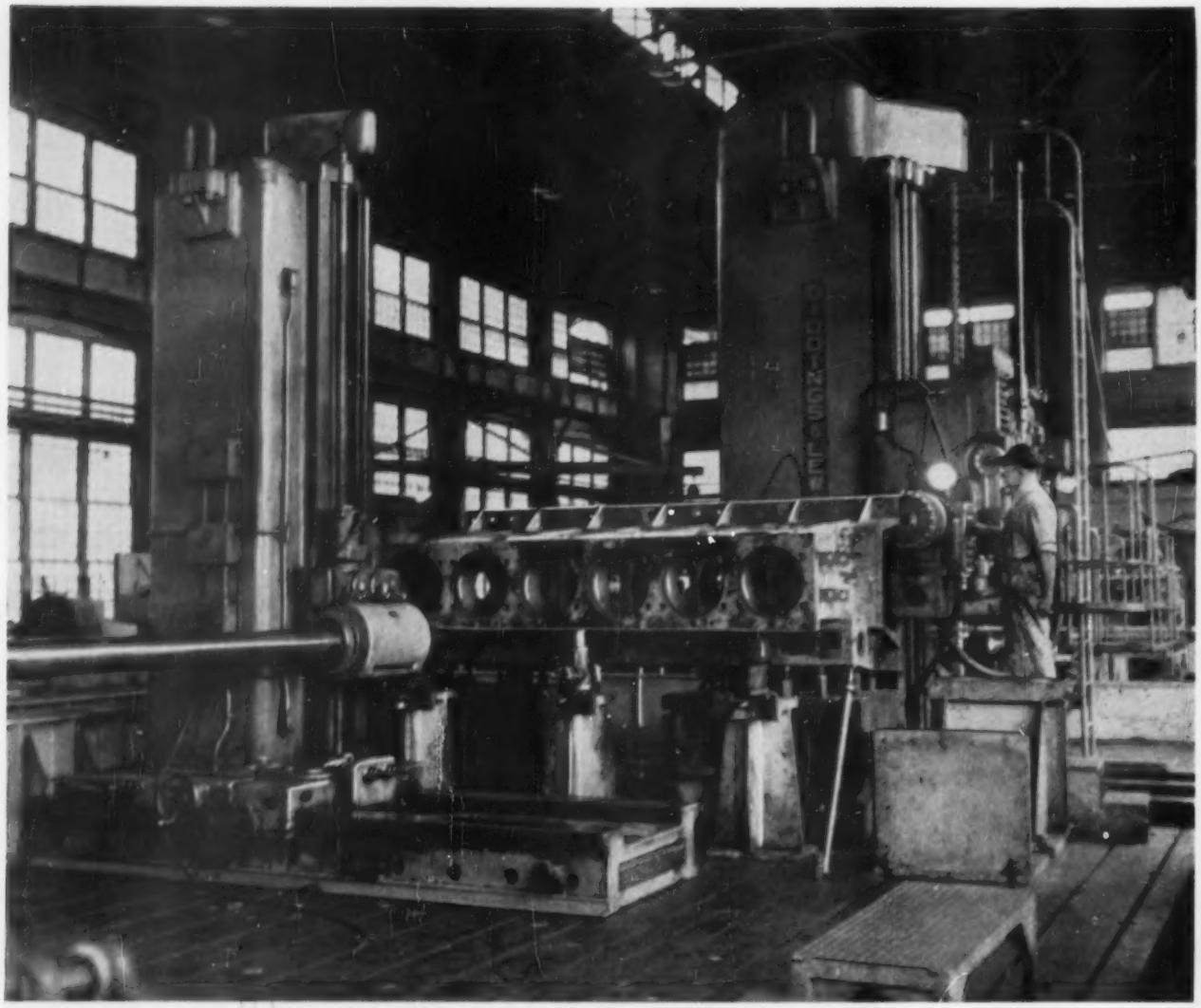
rest cuts centerless grinding costs



Bed-Mounted Work Rest... rigid, solid construction absorbs and dissipates forces from heavy cuts.

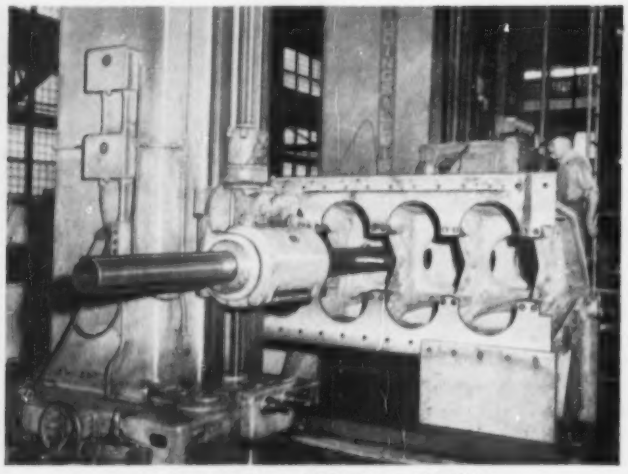
...only Landis Centerless Grinders with stationary work rest give increased production through maximum work support.

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA



In operation at the Juniata, Pa., diesel shop of the Pennsylvania R. R., this versatile Giddings & Lewis Model 560-FUAR (floor-type) horizontal boring, drilling and milling machine performs milling and boring operations to precision tolerances on 6-cylinder engine blocks.

Giddings & Lewis Model 560-FUAR horizontal is shown finish milling the bottom rail on a 6-cylinder engine block for diesel engine.



Picture shows how G&L's Model 560-FUAR horizontal performs precision line boring operation of liner pit in diesel engine block.

SAVE time and setups

machining 6-cylinder engine blocks at railroad diesel shops

Giddings & Lewis Model 560-FUAR (floor-type) horizontal boring, drilling and milling machine is equipped with a 6" dia. spindle, underarm spindle support and end support on runway. It insures maximum productive capacity at the Pennsylvania R. R. diesel shops in Altoona, Pa. This highly versatile machine is used for milling the bottom rails and boring on 6-cylinder Baldwin engine blocks.

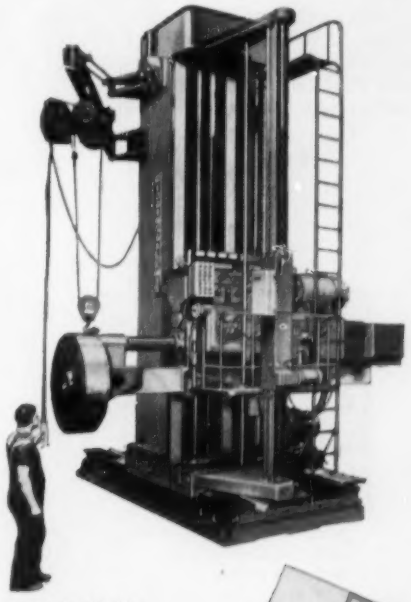
Rugged in construction, this Model 560-FUAR mills bottom rails with a 14" diameter face mill cutter with carbide tips. It also rough and finish bores to exact tolerances the six 14.750" diameter cylinder holes, using a 6" boring bar equipped with a Davis regular type two-cutter block.

What's more, when this machine is equipped with G&L's broad line of optional equipment and accessories, you can perform a wide variety of machining operations beyond the range of standard machines.

For more information on how this machine can help you increase production and lower costs, see your G&L representative, or write to factory.

Giddings & Lewis Model 570-FUAR Horizontal Boring, Drilling and Milling machine features broad line of *OPTIONAL EQUIPMENT:*

- 7-inch diameter spindle with underarm support for mounting such productive machining attachments as shaper-slotter head, angular milling attachment, 46-inch face plate drive and 48-inch continuous feed facing and boring head.
- Power hoist, mounted integrally with the machine column, facilitates handling and setting up of heavy accessories.
- Built-in elevator on machine's 21-foot column enables the operator to select the most ideal working position in relation to the headstock and work. Elevator operates independently of the machine headstock, or simultaneously with headstock as desired.
- Three independently operated d-c drive motors assure maximum flexibility for profiling and contour milling operations.



Literature Available:
For complete specifications on G&L 50 Series (floor-type) horizontal boring, drilling and milling machines, ask for Catalog No. 50-F.

G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

G-63

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines—table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Machines.

90-Minute

now accomplished

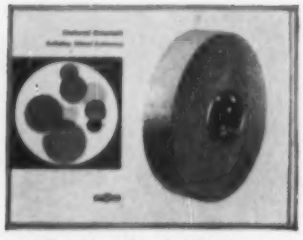
Have you ever seen an operator balance a grinding wheel mount on conventional static balancing ways? It's a tedious operation, and may require 90 minutes or more to remove the wheel mount, balance and replace it. Cincinnati decided to do something about this. They developed automatic grinding wheel balancing . . . it does the job ten times more accurately and infinitely quicker and easier.

This exclusive Cincinnati feature automatically balances the grinding wheel mount on the machine . . . within a few seconds . . . while the spindle rotates at its operating speed. **This exclusive Cincinnati feature** eliminates vibration and resultant chatter on the work . . . permits more effective stock removal . . . reduces wheel cost per workpiece.

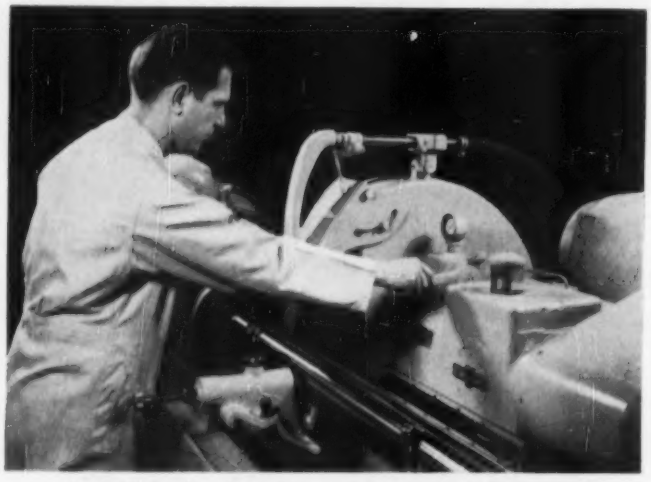
FILMATIC spindle bearings and automatic grinding wheel balancing constitute a team that just can't be beat for lower cost precision cylindrical grinding. Best of all, these features are standard equipment on CINCINNATI® FILMATIC 6"R, 10"L, 10"R, 14"L, 14" and 16" Plain Grinders, and on 6"R, 10"L, 10"R and 14"L Angular Wheel Slide Grinding Machines. Write today for the complete balancing story. Ask for publication No. G-637-2.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

FILMATIC



Publication No. G-637-2 explains the Cincinnati Automatic Balancing principle. Write for a copy.



In the illustration above the operator shows how easy it is to balance the grinding wheel on a CINCINNATI FILMATIC 10"R x 72" Plain Hydraulic Grinder.

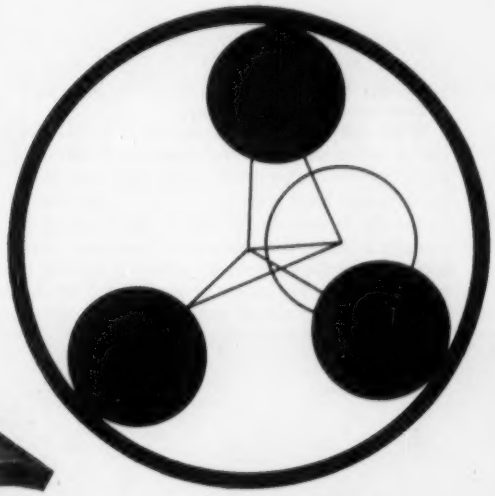
CINCINNATI

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE

Exasperating Job

automatically in seconds



Symbol of Automatic Grinding Wheel Balancing . . . the greatest timesaving feature to be found on any precision grinding machine.

Automatic Grinding Wheel Balancing and FILMATIC Spindle Bearings are exclusive Cincinnati features . . . they just can't be beat for producing the finest finish at the lowest cost on your precision ground work.

GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

7 great lapping machines for your profit-boosting

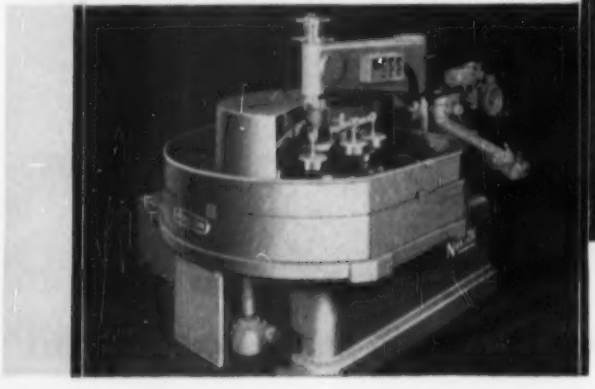
If you are performing single or parallel face flat lapping operations you'll get real profit-boosting qualities from the ability of these machines to improve your product quality — shorten production time — lower your lapping costs. In other words — from their ability to give you the "Touch of Gold".

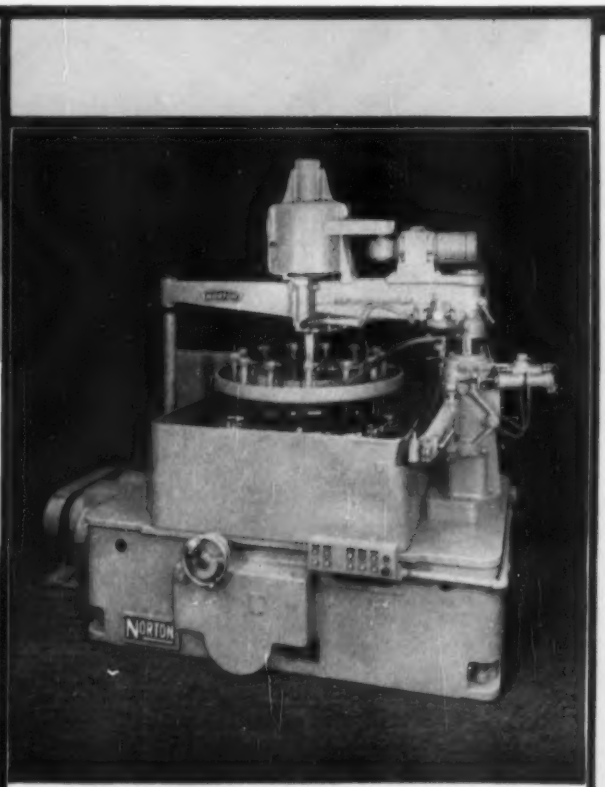
With NORTON HYPROLAP® machines you'll lap fast — and get clean work on which you can do further machining without cleaning operations — because their bonded abrasive laps leave your parts free of imbedded grit. The hydraulically operated truing devices on these machines provide additional advantages in assuring truth of lap face — plus the convenient means of quickly changing lapping action by rough or fine truing of the lap by simple adjustment of the speed of the truing arm.

For operations requiring cast iron laps, you will get continuing high investment return — and steady, low cost production from the #16-FC and #28 Lapping Machines — because of their simplicity of operation — and outstanding durability. They'll operate steadily for you with minimum attention or maintenance — hour after hour — day after day.

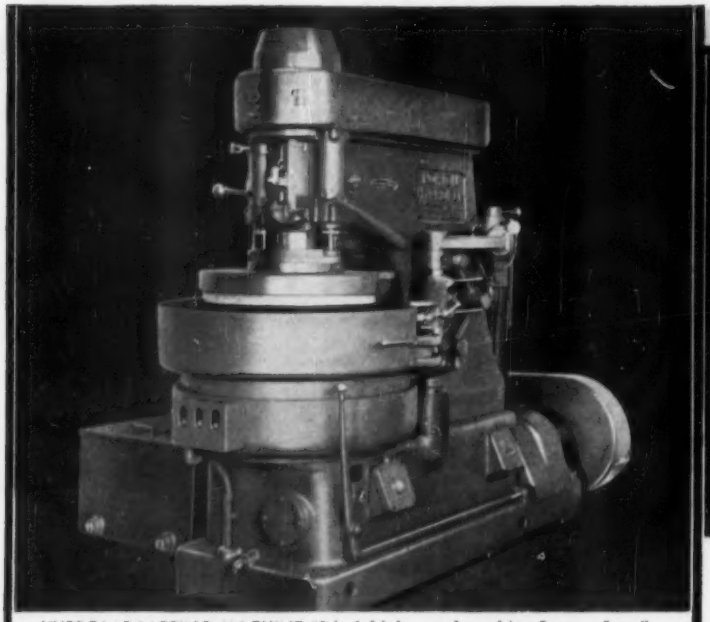
For further facts see your Norton representative or write direct. And remember: only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

HYPROLAP SINGLE FACE FLAT LAPPING MACHINES #60-F (above) and #36-F (below). Sensational performers using bonded abrasive laps and filtered coolant. Provide clean seal surfaces, wear surfaces or reference surfaces for further machining. Available for small or large production lots: plain timed cycle; automatic continuous feed or semiautomatic continuous feed. Rigid power-operated truing arm insures true flatness of abrasive lap and finished work pieces. Heavy or light parts handled with equal ease.

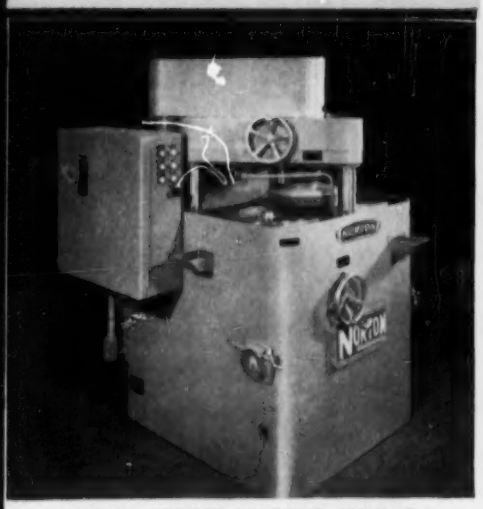




HYPROLAP SINGLE OR PARALLEL FACE FLAT LAPPING MACHINE #48-F. Similar to the #60-F and #36-F Lappers in speed and accuracy, with provision for parallel face flat lapping. For single face flat lapping the machine mounts a single 48" diameter bonded abrasive lap. For lapping opposed parallel flat surfaces an upper lap is added. Arrangements: plain timed cycle; automatic continuous feed or semiautomatic continuous feed.

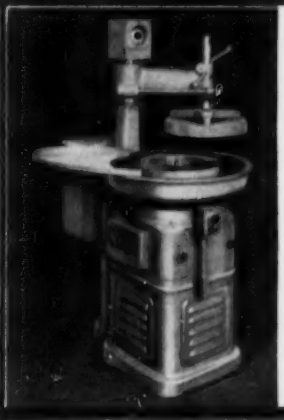


HYPROLAP LAPPING MACHINE #26. A high speed machine for two face flat lapping or cylindrical lapping that finishes up to 100 or more work pieces simultaneously. Lapping pressure is hydraulically powered and controlled — an exclusive Norton development. Arrangements: plain timed cycle; automatic continuous feed or semiautomatic continuous feed. Like other HYPROLAPS, lap truing is hydraulically powered and controlled.

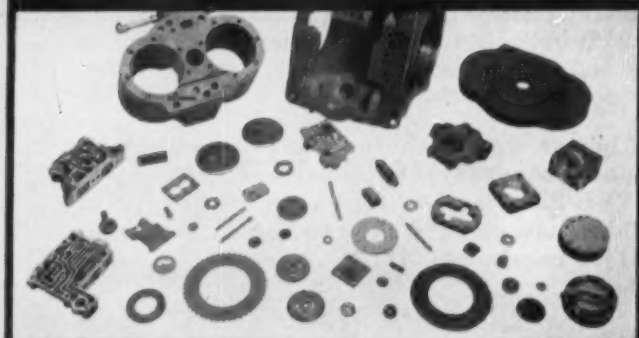


HYPROLAP LAPPING MACHINE #12-F. For small, parallel face flat lapping. Ideal for small ball bearings. Arrangements: plain timed cycle; automatic continuous feed or semiautomatic continuous feed. All three provide fast efficient lapping with selective speeds for laps and work-holders, permitting positive selection of ideal speeds for each job. Cleanliness of finished work surfaces eliminates the need for cleaning operations.

PLAIN TIMED CYCLE LAPPING MACHINE #28. Produces flat or cylindrical surfaces to extremely close tolerances and high degree of finish. Uses cast iron laps with loose abrasive. An attachment for cylindrical lapping is furnished with the regular flat lapping arrangement. For plug gage or gage block tolerances the machine is unsurpassed. An arrangement for hand lapping with 30", 36" or 40" cast iron laps is also available.



PLAIN TIMED CYCLE LAPPING MACHINE #16-FC. An outstanding performer for flat or cylindrical work, such as Diesel injector parts, plug gages, size blocks, sides of rings and short cylindrical parts. Using cast iron laps with loose abrasive it produces optically flat surfaces to extremely close thickness tolerances. Its fine repetitive accuracy helps reduce inspections and eliminates the need for selective assembly.



NORTON JOB LAPPING SERVICE. Improve your product quality by precision lapping. The Norton Job Lapping Department, complete and modern in every detail, is ready to finish jobs to your exact specifications. Flat or cylindrical lapping operations handled quickly to your tolerance specifications. Parallel face flat lapping is our specialty. See your Norton representative or write direct.

To Economize, Modernize with NEW

NORTON

GRINDERS and LAPPERS

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels
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BEHR-MANNING PRODUCTS: Coated Abrasives
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District Offices: Worcester • Hartford • Cleveland • Chicago • Detroit — *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

what's going on at MARVEL?

1. A NEW BUILDING PROGRAM...

Not long after you read this, we will have completed the MARVEL plant expansion program which will *double* our already considerable manufacturing space. MARVEL'S confidence in the future and its continuing development, coupled with the increasing demand for MARVEL Hack Saws, Band Saws and Hack Saw Blades, makes this expansion mandatory.

2. A NEW "SUPER" BAND SAW

In our enlarged plant, we will demonstrate for the first time, a completely new, heavy duty, all-hydraulic, fully universal MARVEL Band Saw designed especially for High Speed Steel Band Saw Blades. This new "Super" Band Saw is heavier, more powerful and rugged than any band saw yet available. It incorporates a great many new and exclusive design and operating features to make it the most advanced Band Saw for BOTH high production and universal work.

3. AN INVITATION TO "TRY" BEFORE YOU BUY

One or more of the new Band Saws will be set up in our new plant, together with new, improved MARVEL Hack Saws, to demonstrate comparative performance on a wide variety of work. We will also set up specific cutting-off jobs requested by customers or prospective purchasers on *both* types of machines and arrange to have interested personnel observe and check the demonstration of comparative saw performance *on their own work.*

What better way is there to prove to yourself the speed, accuracy, efficiency and economy of MARVEL Saws and to select the right type of saw (hack saw or band saw) to best fit your individual job requirements?

G—1600

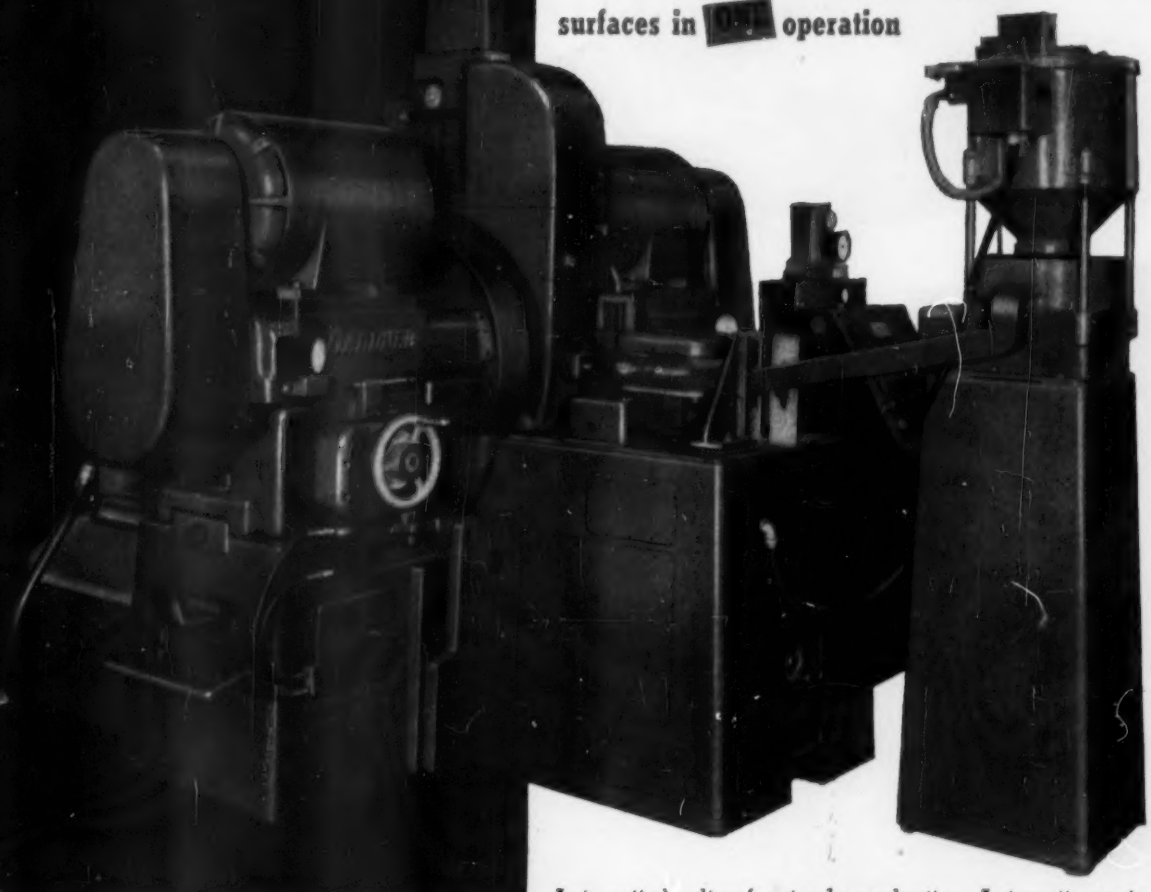
ARMSTRONG—BLUM MFG. CO.
5700 Bloomingdale Avenue • Chicago 39, Illinois

MARVEL Metal Cutting SAWS
Better Machines—Better Blades

9 hours production in 8 hours . . .

disc grinding 6000 bearing races per hour

NEW **Gardner 2H30 disc grinder automatically precision grinds TWO parallel surfaces in ONE operation**



Automatic loading for steady production. Automatic gaging maintains accurate workpiece size through feedback signals.

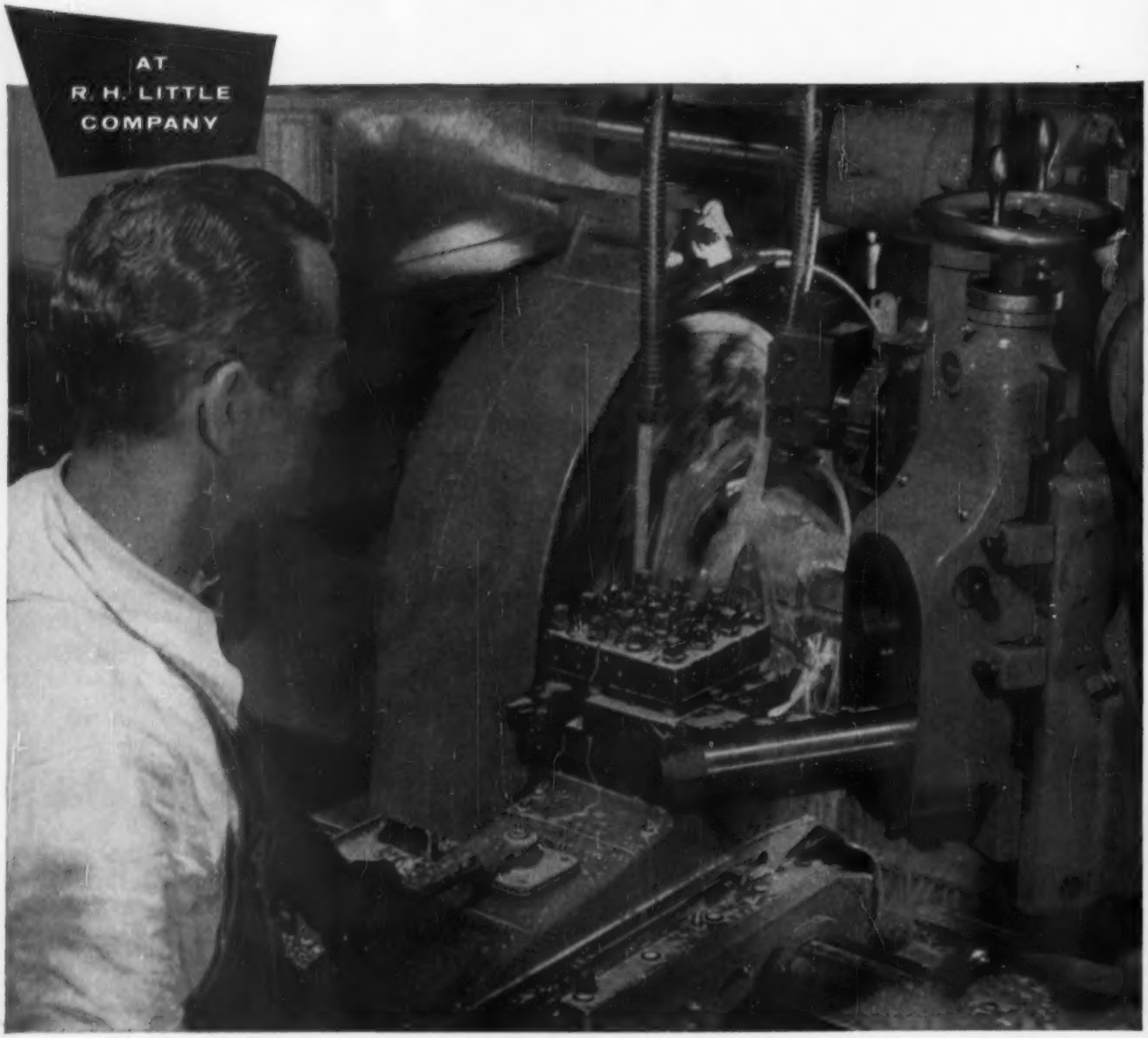
Former Model		New 2H30
5280 per hr.	PRODUCTION	6000 per hr.
.005"—.007"	STOCK REMOVAL	.006"—.008"
	TOLERANCES	
.0001"—.0002"	FLATNESS	.0001"
.0001"—.0002"	PARALLELISM	.0001"
.001"	UNIFORMITY	.0005"

GARDNER

precision disc grinders

BELOIT, WISCONSIN

Power and rigidity of Warner & interrupted —BOOST



Swasey 4-A easily handle severe cuts in tough steel casting

PRODUCTION 200%!

Once again, the cost-cutting combination of power, rigidity and accuracy built into all Warner & Swaseys has more than doubled production—this time up to 200% for the R. H. Little Company of Canton, Ohio.

ENCLOSURES OF SAE 1045 cast steel for diesel-electric locomotive journals, designed by The Timken Roller Bearing Company, are run in 500-piece lots at the rate of 12 to 15 daily on Little's new Warner & Swasey 4-A Extra-Heavy Duty Saddle Type Turret Lathe.

The part has ⅛ to ⅜-inch stock per side. In addition to heavy stock removal, severely-interrupted cuts put a terrific strain on both tooling and the machine. Power and rigidity of the 4-A easily handle the job. On the first operation involving combined and multiple cuts—four in all—metal removal is equivalent to 1½ inches. Three cuts—two turning and one boring—are taken from the hexagon turret combined with a facing cut from the square turret. Carbide tooling roughs the part at 250 SFM—.017 inch feed; finishing operations are at 400 SFM.

This same casting was previously machined at the rate of only 5 a day when run on a 20-year-old lathe. Production was held down due to the machine's lack of horsepower and rigidity. This caused excessive downtime for tool changing and required constant operator attention to the maintenance of longitudinal and diametrical tolerances.

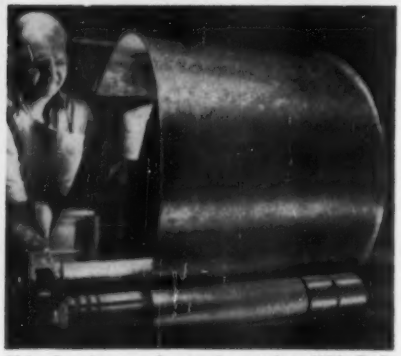
When you require extreme machining accuracy, with heavy metal removal, call the Warner & Swasey Field Representative. He will discuss with you how the job can be handled most efficiently.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS ... WITH A WARNER & SWASEY

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

"USS GALVANIZED STAND UP DURING

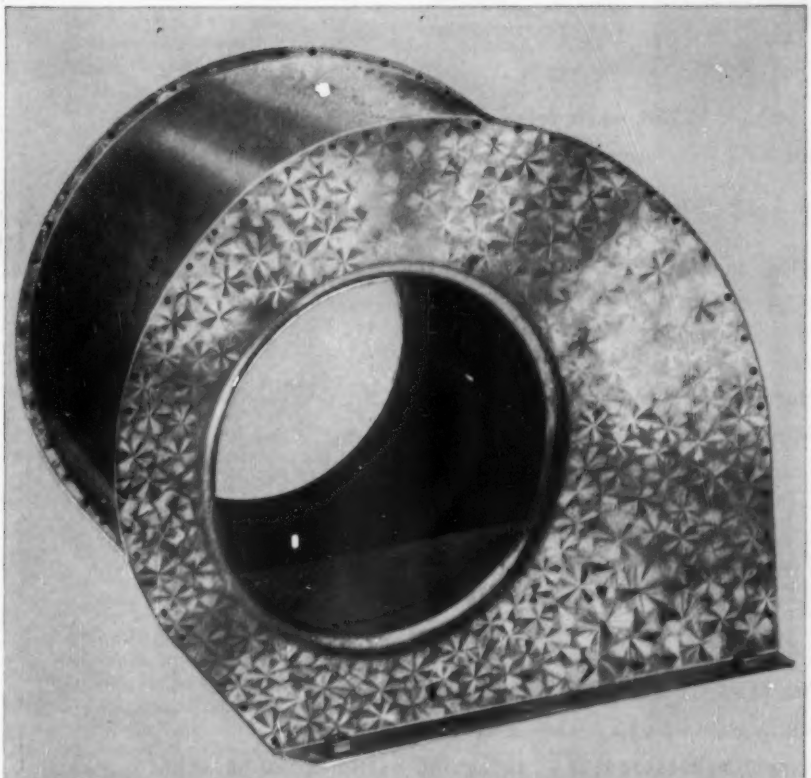
Mr. Stephen Kuznia, foreman, says, "USS Galvanized Steel Sheets hold together well in our spot welding process. The sheet resists flaking when going through extreme forming and looks good as a finished product." He is shown here holding housing scroll.



This Carrier workman is putting USS Galvanized Sheet through a forming operation. The finished form will be the heel of a fan housing.

STEEL SHEETS FORMING OPERATIONS,"

says Mr. Norbert A. Wiesnet
Carrier Corporation, Syracuse, New York



The finished fan housing is just one of the many products of the Carrier Corporation designed for home and industrial air conditioning and heating. Carrier is the oldest air conditioning firm in the country and has thousands of pieces of equipment in use in such notable buildings as The Pentagon Building, the hotels in the Hilton Chain and in the United Nations Secretariat.

"USS GALVANIZED Steel Sheets have given satisfactory performance in the Carrier stamping department," continues Mr. Weisnet, Buyer of Galvanized Sheets, "because the zinc coating adheres tightly to the steel. Our percentage of rejects with USS Galvanized Steel Sheets is low."

The ability of USS Galvanized Steel to resist flaking is important in brake press operations, too. Unless the sheets used here have good flaking resistance, zinc flakes could fill up the V-die, causing damage to sheet sections and loss of manhours.

USS Galvanized Steel Sheets form easily under extreme conditions; they do not corrode when used for drip pans; they hold strong, tight welds; they are economical to use; and they make a neat, good-looking end product.

For more information on USS GALVANIZED STEEL SHEETS, and details on what this quality product means to you, just write or call the nearest United States Steel district sales office. They'll be happy to give you any information you may require.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS GALVANIZED STEEL SHEETS

USS

UNITED STATES STEEL

Another **FIRST** for **LAPOINTE**

LAPOINTE introduces a NEW MODEL CONTINUOUS-BROACHING MACHINE

Now you can see the work being broached, where formerly this was impossible. Now you can get at the broaches themselves, which are readily accessible for easy changeovers.

And all this has been accomplished without sacrificing rigidity.

The pivot-hinged side opening, another new Lapointe feature, offers access to the broach bodies and the fixtures which are on the chain. This greatly simplifies the changing of fixtures.

Perfectly adapted to automation, this machine is remarkably efficient for many types of surface broaching applications such as the "pine tree" form on jet engine buckets and wheels, and other similar intricate forms. It is built for chatterless broaching, and available in a series combining various capacities and hp.

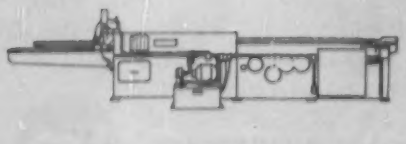
By converting to Lapointe-Broaching you can drive down your production costs. Let one of our Field Engineers show you how.

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

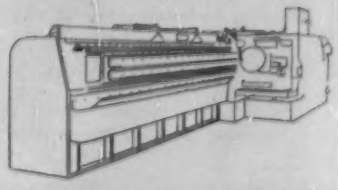
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



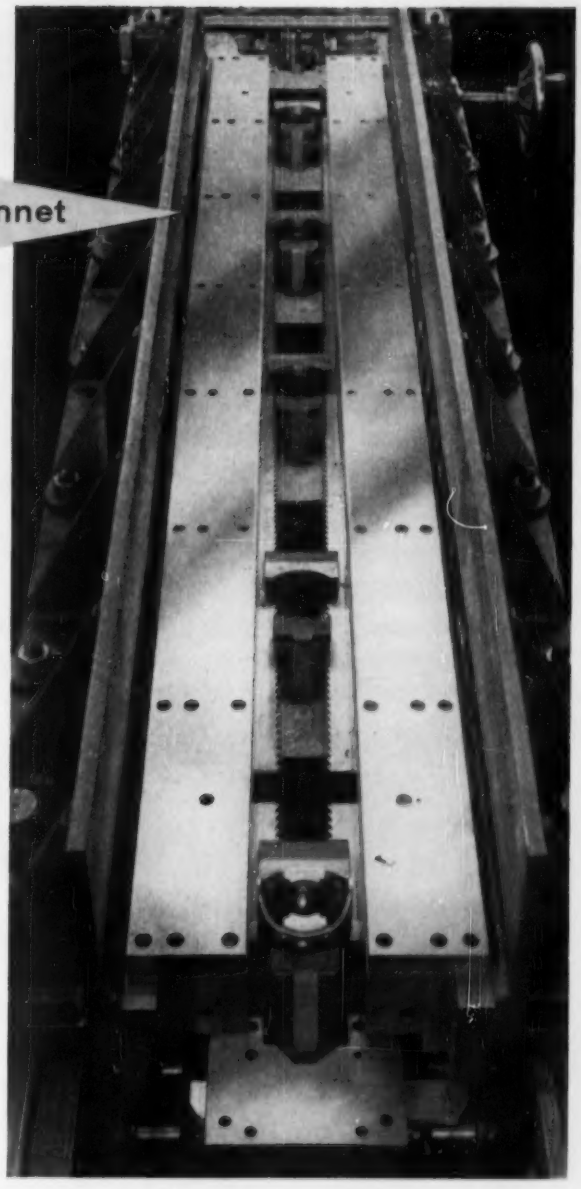
60" STROKE HORIZONTAL, ELECTRIC

CH CONTINUOUS BROACHING, ELECTRIC

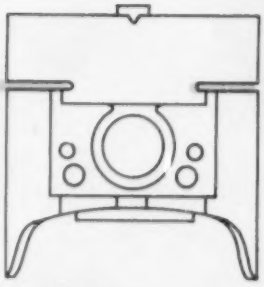


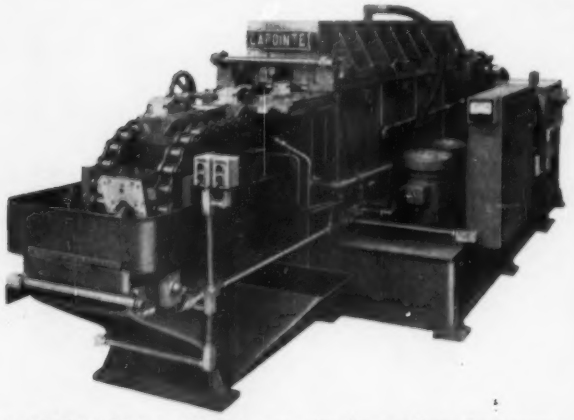
SRHE SINGLE RAM HORIZONTAL, ELECTRIC

with open top, eliminating the bonnet



Simultaneously broaching 2 slots every 3 seconds in this Aluminum Automotive Piston, LAPOINTE Continuous-Broaching rolls up the impressive production total of **1200** *complete parts per hour!*



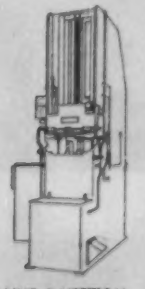


LAPOINTE 20 h.p., 90-inch capacity Heavy Duty Continuous Horizontal Broaching Machine. Using 17 automatic-clamping, self-releasing fixtures, it broaches at a surface speed of 35 fpm, broaching two slots .093″ wide and 1″ deep, holding location within .003″ from top of piston.

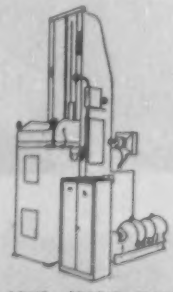
Automatic parts feeder (chute type, not shown here) is loaded by the plant conveyor system, thereby completely automating the broaching operation.

Provided with electric interlock which prevents damage if a part is not perfectly oriented in fixture.

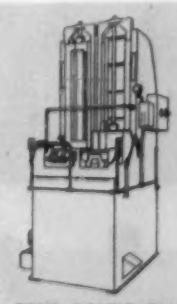
Overhead view, showing the open top design which eliminates the bonnet. Broaches and work are always visible.



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

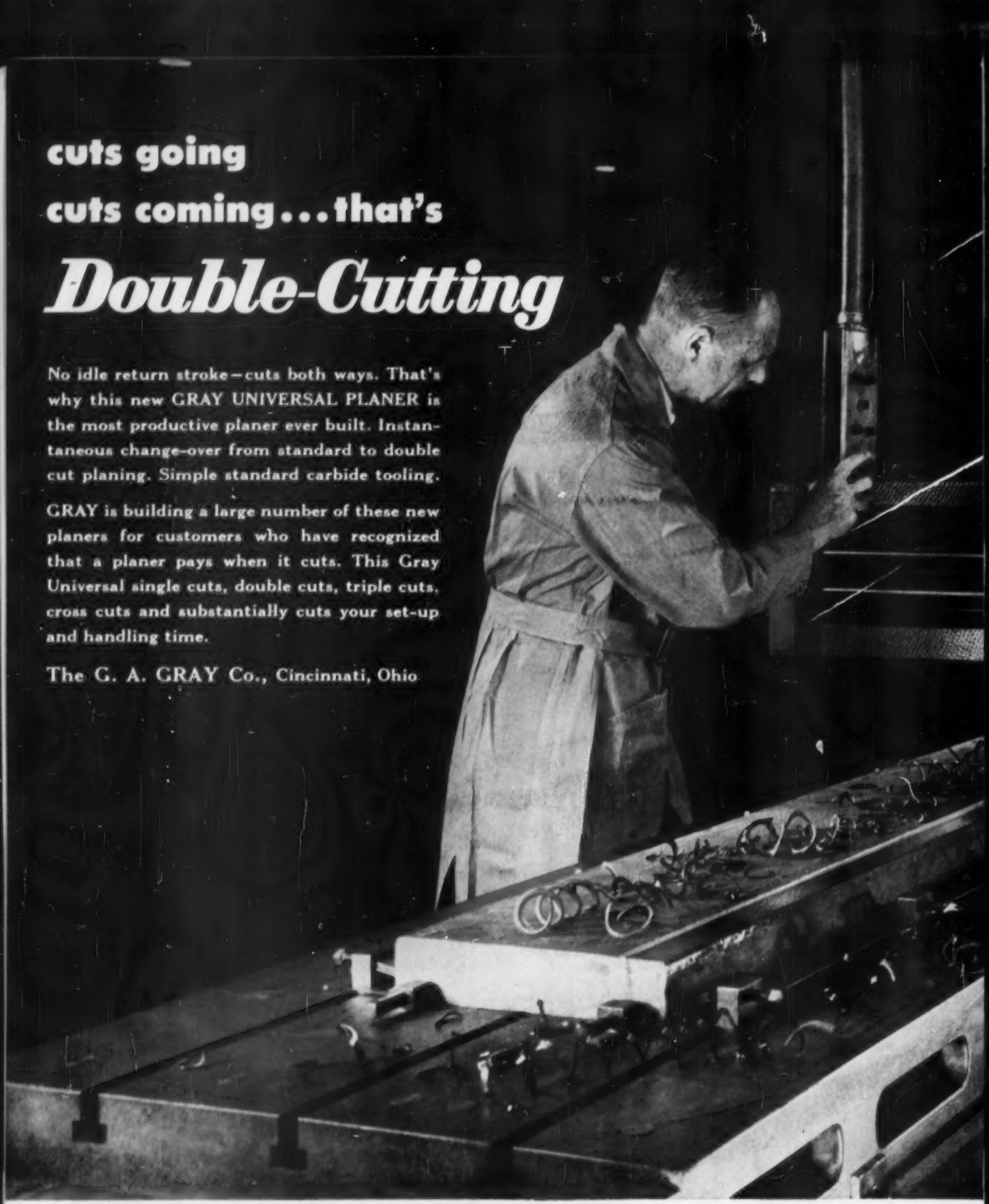
BROACHING

cuts going
cuts coming... that's
Double-Cutting

No idle return stroke—cuts both ways. That's why this new GRAY UNIVERSAL PLANER is the most productive planer ever built. Instantaneous change-over from standard to double cut planing. Simple standard carbide tooling.

GRAY is building a large number of these new planers for customers who have recognized that a planer pays when it cuts. This Gray Universal single cuts, double cuts, triple cuts, cross cuts and substantially cuts your set-up and handling time.

The G. A. GRAY Co., Cincinnati, Ohio

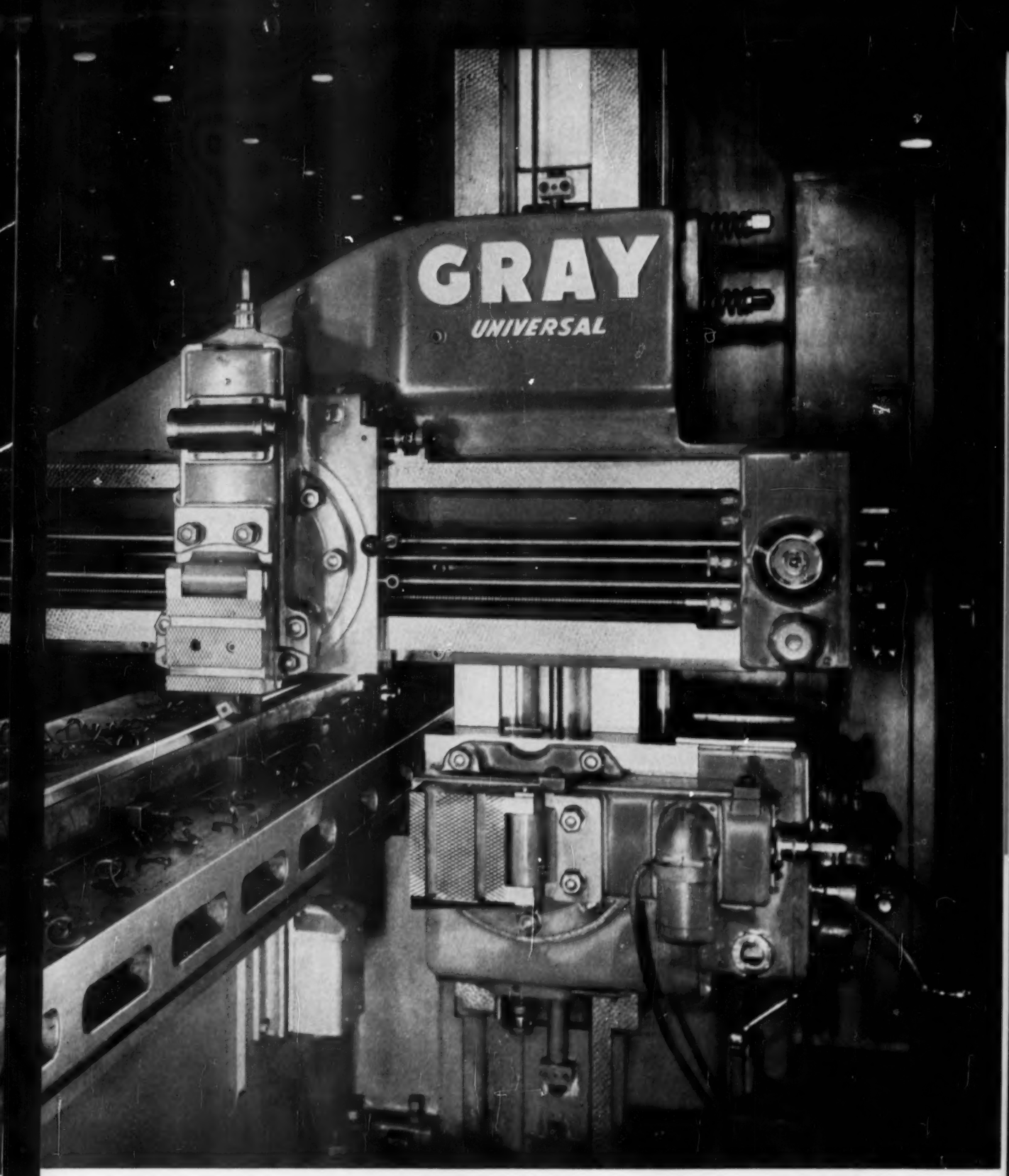


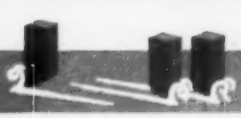
heavy-duty planing

The Gray Universal is the world's most powerful planer available for conventional planing. Its rigidity and speed are ideally suited for modern carbide cutting.

double cut planing

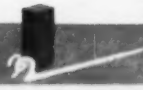
The flick of a lever, the touch of a button permits double cutting. Elimination of the idle stroke insures the world's most efficient flat surface machining. Only simple carbide tools are required.





triple cut planing

Rough and rough-finish plane at the same time. Rough by double cut planing and simultaneously rough-finish with a single point tool. Then finish plane without a tool change.



cross planing

Eliminates extra settings by cross planing the occasional keyways, chamfered corners, and other troublesome small cross surfaces that formerly added hours to your set-up time.

A "natural" for aircraft parts

New! Revolutionary!

Colonial
ONE-WAY
Surface Broacher

"Eliminates" Return-Stroke
"Eliminates" End of Stroke
"Doubles" Length of Stroke

For complete information on the new Colonial ONE-WAY surface broacher, ask for Bulletin VC-55

MECHANICAL DRIVE
AC MOTOR
VARIABLE SPEED
HYDRAULIC OR
MECHANICAL FIXTURES
CARBIDE OR
HSS BROACHES
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FOR LOW CEILING
LONGER TOOL LIFE

EXTREME ACCURACY
GUARANTEED
STROKE LENGTH
UP TO 200 INCHES
SPEEDS UP TO 50 FEET/MIN.
ONE LONG STROKE—
ONE PART
OR
MULTIPLE SHORT STROKES
ON MULTIPLE PARTS
CONTINUOUS OPERATION

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COLONIAL
BROACH & MACHINE CO.
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UNIFIED BROACHING is the key to successful broaching

Stainless Steel
welding information:

how to get strong welds in thin sections

Thin Stainless Steel sections can be easily welded without flux if you use an inert gas-shielded electric arc procedure. The welder in the picture is using an argon atmosphere. It shields the welding zone from slag impurities, eliminates fumes and spatter, and produces a clean, dense weld.

The process is especially suited for USS Stainless Steel grades 301, 302, 303, 305, 316, 317, 321, 347, and 410, in thicknesses from .025 to .25 inch. The tungsten electrode used is not consumed, and it will not pick up carbon. If filler metal is needed, it can be the same as the parent metal. There is little distortion, even in thin sections, when properly jigged.

If welding rod is used, it should be of the proper composition, and all the usual joints can be made easily. Either DC or AC current can be used, but direct current gives greater penetration and speed. Surfaces should be clean, and you should use a back-up bar, or a mixture of Stainless Steel flux and shellac on the under side.

To develop the very maximum strength and corrosion resistance, the welds should be annealed—although this is not always necessary. The subject is covered fully in our comprehensive Stainless Steel "Fabrication" book. Write on your company letterhead for your copy to: United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

If you'd like, we'll have a representative call and discuss your special shop problems.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

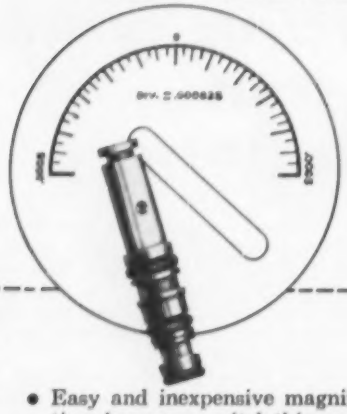
USS STAINLESS STEEL

SHEETS • STRIP • PLATES • BARS • BILLETS
PIPE • TUBES • WIRE • SPECIAL SECTIONS

UNITED STATES STEEL

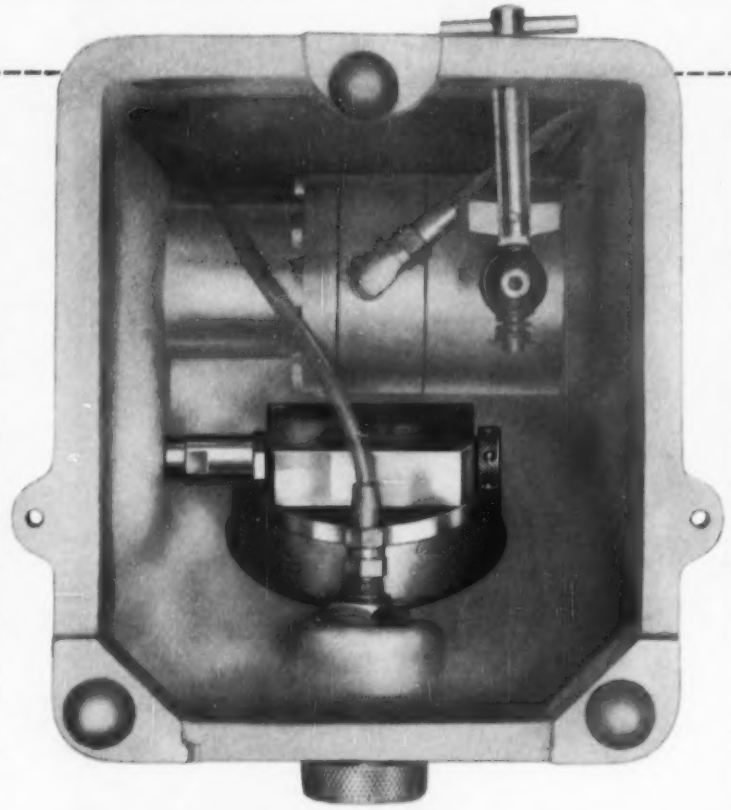
Get this Inside Story

for Lower-Cost Air Gaging



This simple venturi tube, and its corresponding dial, is the real key to more accurate, more trouble-free air gaging performance. The Taft-Peirce CompAIRator uses this tube in a unique *Venturi Circuit* which provides advantages not found in any other type of air gage. Check these exclusive extras . . .

- Easy and inexpensive magnification changes — switch this venturi and dial in just five minutes
- Only 10 pounds operating pressure, cuts air cost in half
- Fast reaction permits remoting base unit from fixture without using "booster" — no time lag or lowered sensitivity
- Velocity-type venturi circuit permits checking smallest diameters with standard gaging members — ID's down to .055″
- Wide tolerance range: can gage tolerances as narrow as .0001″, or can be designed to check as wide a range as .125″
- Full linearity through 180° of dial scale
- Built-in fast response, easily tied in with automatic machining and inspection operations
- Can be mounted at any angle without disturbing readings



The simple Venturi circuit, extreme flexibility, and trouble-free operation make Taft-Peirce Air Gaging your lowest-cost quality control tool — whatever the production rate. It has been proved in hundreds of installations, performing all kinds of gaging operations.

Get ALL the facts . . . from your nearest Taft-Peirce representative, or write direct for Air Gage Catalog No. 613.

Taft-Peirce Single Dial CompAIRator, complete with plug and masters. CompAIRators are also available in double or multi-dial units, can be used with standard air plugs, air rings, and air snap gages — directly attached to cabinet or to air hose. Special features designed and built to order.

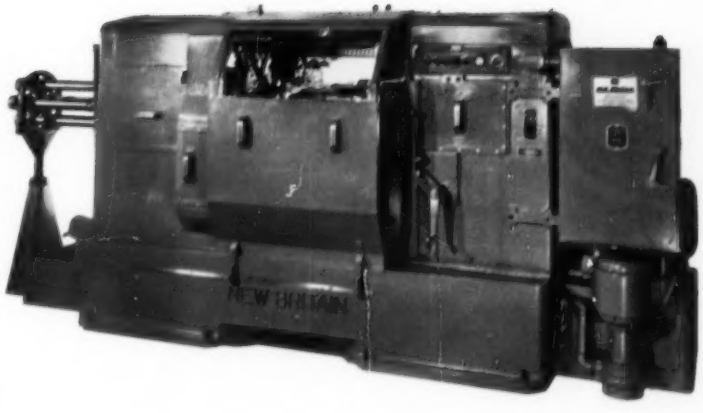
TAKE IT TO TAFT-PEIRCE

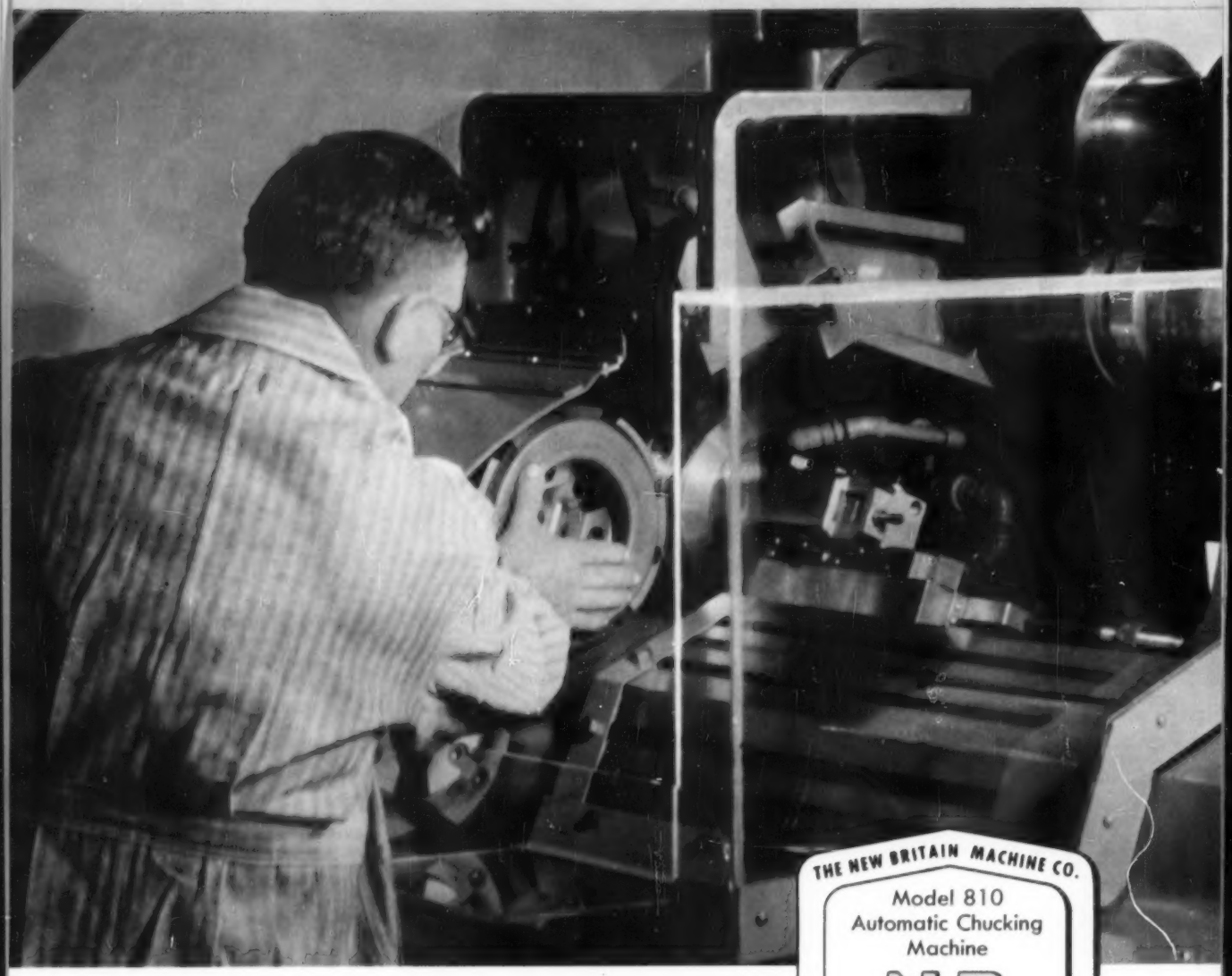
TAFT-PEIRCE MANUFACTURING CO.
WOONSOCKET, RHODE ISLAND

T-P Means TOP Precision

8 tons of metalworking efficiency

If you are interested in absolute minimum cost per piece on either long or short runs, investigate the Model 601 New Britain bar machine. Massive enough and powerful enough to handle your new high-speed cutting requirements. Super-high spindle speeds, maximum versatility, optional universal tool slide cam which eliminates cam change time. With the Model 601 on your floor you have "the shortest distance" between bar stock and finished piece. Write for Bulletin 6H.



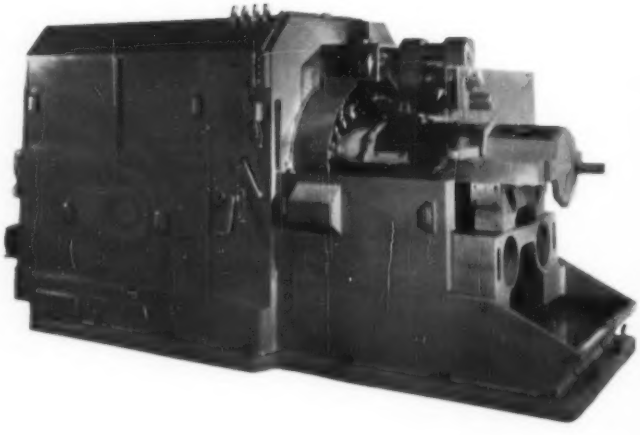


new New Britain chuckers handle bigger work pieces

If you know chucking machines you know the world-wide reputation of New Britains for accessibility, versatility, quick setup and sustained high production of precision parts.

Now new New Britain models enable you to apply this high productivity to pieces with chucking diameters up to ten inches on eight-spindle machines, twelve inches on six-spindle production and fifteen inches on four-spindle work.

Check this practical approach to more profitable production with your New Britain representative, or write for Bulletin 3R. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



THE

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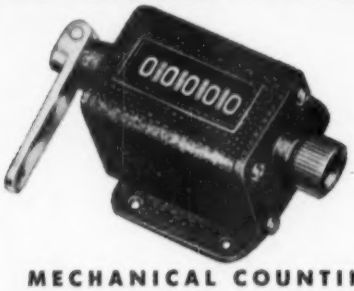
OF

1 2 3

Why is COUNTROL

important in every business today?

Countless times a day, every business needs to know "how many? . . . how much? . . . how far? . . ." and many other questions that can be answered only by facts-in-figures. But how to get these figures . . . from so many different machines, processes, operations and systems? Veeder-Root Counters are doing it every day, by means of:



MECHANICAL COUNTING

Small Resets count strokes, turns, or pieces . . . are used by thousands for moderate duty in parts inspection, quality control, conveyors, machine tools, light presses, etc.

HAND COUNTING

Where objects or units cannot be counted electrically or mechanically, hand-operated counters like this Hand Tally do the job. For instance, quick spot checks of production or performance, traffic count, inventory, etc. Fits palm of hand, counts one for each pressure of thumb lever, resets to zero by turning knob.

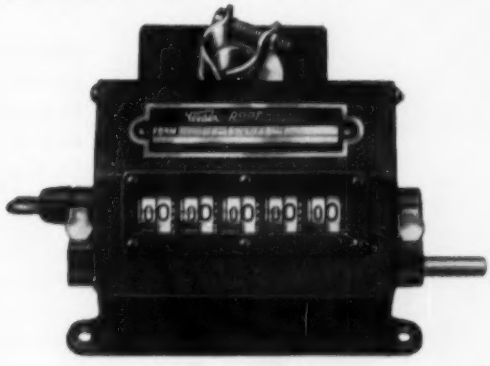
Insist on Standard

VEEDER-ROOT COUNTERS

from your Industrial Supply Distributor

ELECTRICAL COUNTING

These remote-indicating counters bring your production machines as close as your office wall. AC or DC, they can be connected in series with any simple switch, and will transmit production figures *instantly* over any distance. May be panel-mounted in groups.



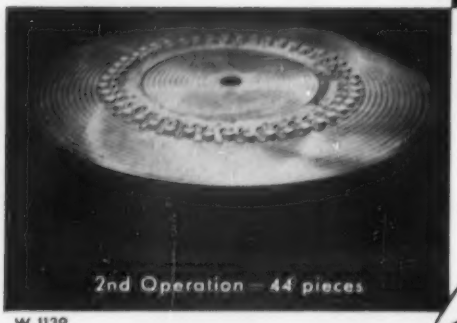
CONTROLLING

Set it for the exact number of turns, pieces, or operations required . . . and this Predetermining Counter will control the run *exactly* . . . preventing over-runs and shortages. When the predetermined number is reached, counter will light a light, ring a bell, or actuate a stop-motion.

IN SUM: *If it can be counted or controlled . . . count on Veeder-Root to do it. Get in touch with your Industrial Supply Distributor for standard counters for application to your production machines and processes. And get in touch with Veeder-Root for counters to be built into original equipment.* **Veeder-Root Inc., Hartford 2, Connecticut.**

Another example

W-1138



W 1139

# of Blanchard versatility

No. 303 Stainless Steel Forging

653 oddly shaped, non-magnetic workpieces

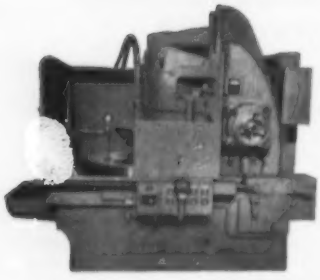
Blanchard Surface Grinders are noted for their unusual versatility – like grinding small, non-magnetic stainless steel forgings in quantity.

In the first operation, 653 forgings are loaded and blocked between rings on a No. 18 Blanchard, with 36" magnetic chuck (stock removal .010"). Parts, chuck and rings are sprayed with oil, and molten sulphur is poured around the parts to hold them. After grinding, the sulphur is easily stripped away.

This entire operation takes only 1½ hours – including preparation of the sulphur.

In the second operation, 44 pieces are set in a notched steel ring. Tilting the wheelhead and maintaining wheel pressure in one direction holds these non-magnetic pieces in the notches. Stock removal from this surface is .030", to tolerance of ±.003. Each load takes eight minutes – floor-to-floor.

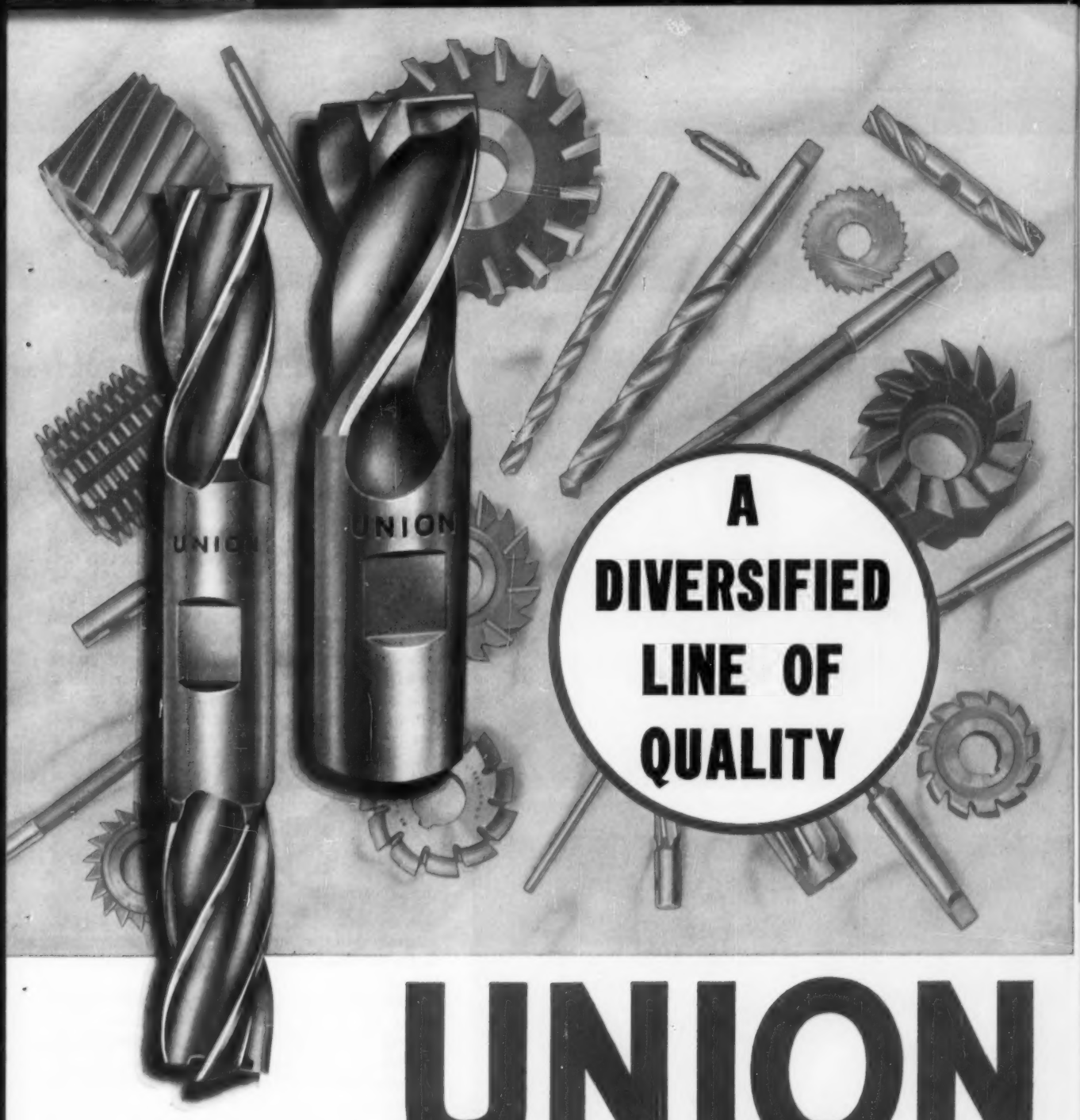
As a result of this ingenious workholding, each piece is ground on both sides in a fraction of a minute, at less than 98¢ abrasive cost for all 653! That's typical of the convenience and economy of grinding on a Blanchard – whether the parts are magnetic or non-magnetic!



Send for free copies of "Work Done on the Blanchard", 4th edition, and "The Art of Blanchard Surface Grinding", 3rd edition – recently revised.

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**



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Prompt, Dependable Service

For every end milling operation there's a particular end mill that will do the job for you quickly, accurately and economically.

UNION offers a complete selection of top quality end mills in standard and special types to suit the requirements of your job.

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

Owners and Operators of: S. W. CARD DIVISION, Mansfield, Mass.
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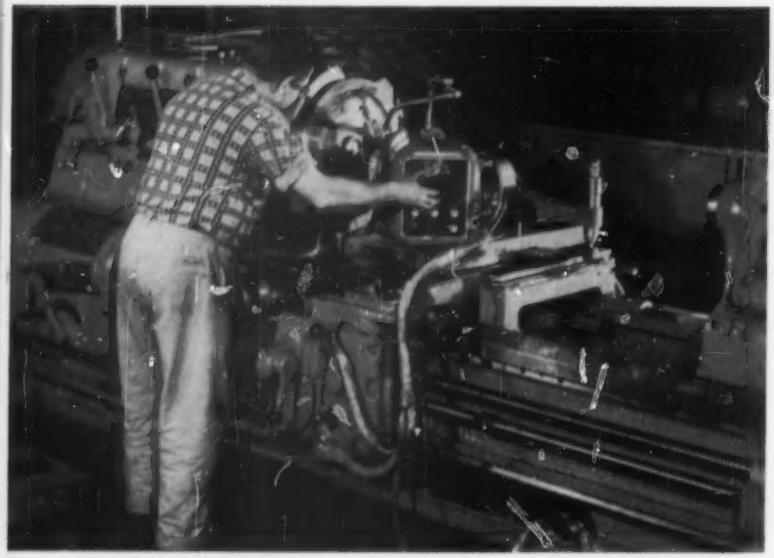
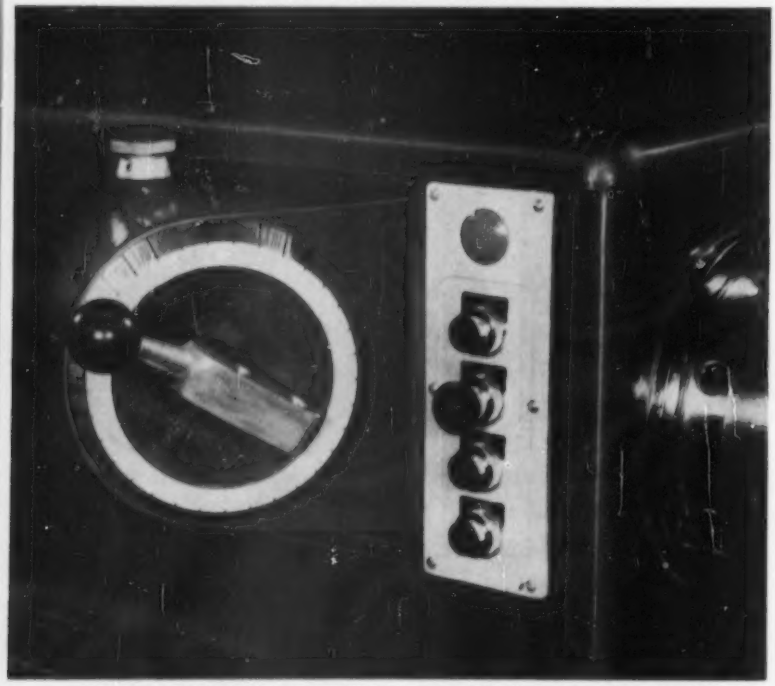
AXELSON production

AXELSON MANUFACTURING COMPANY



TURBO-JET ENGINE PRODUCTION. Contouring aft side of 125-pound turbine wheel on Axelson lathe equipped with electronic duplicator.



CENTRALIZED HYDRAULIC PRESELECTOR is one of the keys to easier operation and unusual flexibility of the Axelson 2516 heavy-duty lathe. With the preselector, the lathe can be used with equal ease for long-run production or single set-up operations.

ELECTRONIC TRACER CONTROL FEATURED IN JET TURBINE PRODUCTION

Rotating engine parts, which operate under widely fluctuating environmental conditions during high-speed aircraft flight, must be precisely machined so expansion and contraction of the metal will not affect engine performance.

At General Electric's AGT Division, Evendale, Ohio, Axelson lathes equipped with electronic duplicators reproduce turbo-jet engine parts. Using simple, flat templates, the electronic duplicators precisely control the lathes for highly-accurate contour-facing operations. Special carbide-tipped tools are used in the two-stage turning operations on the 28-32 Rockwell, Timken steel turbine rotor wheels. Floor-to-floor time for these two operations is less than an average work day.

NEW 2516 HEAVY-DUTY LATHE SIMPLIFIES OPERATOR CONTROL

Speed selection of 32 different spindle speeds from 11 to 1600 RPM has been greatly simplified in the new Axelson 2516 heavy-duty lathe through the use of a hydraulic preselector.

The operator can preset a new spindle speed while the lathe is in operation, move to the end of the bed and, without returning to the headstock, automatically switch to the preselected speed by operating a lever on the apron.

Speed changes are made through involute clutches; the headstock contains no sliding gears.

For a complete description and detailed specifications on the 2516, the new Axelson 4025 and Axelson Tool Room, Medium-Duty and other Heavy-Duty Lathes, write for bulletins A10-5507 and 5504.

AXELSON

AXELSON MANUFACTURING COMPANY
Division of U. S. Industries, Inc.
6160 SOUTH BOYLE AVENUE
LOS ANGELES 58, CALIFORNIA

and maintenance news

DIVISION OF U. S. INDUSTRIES, INC. / 6160 SOUTH BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA

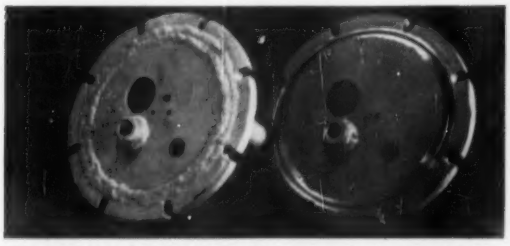
Lathe flexibility opens new fields for job-shop machining

"Ours is primarily a job shop specializing in fittings, special valves and eductors. Each job presents a different problem, and in many cases the setups are more time-consuming than actual cutting time. Most of our work is in bronze, monel, stainless steel and hastelloy.

"Before we obtained our Axelsons, we were unable to do the type and class of work we are now doing profitably. We know they've opened up new fields for us.

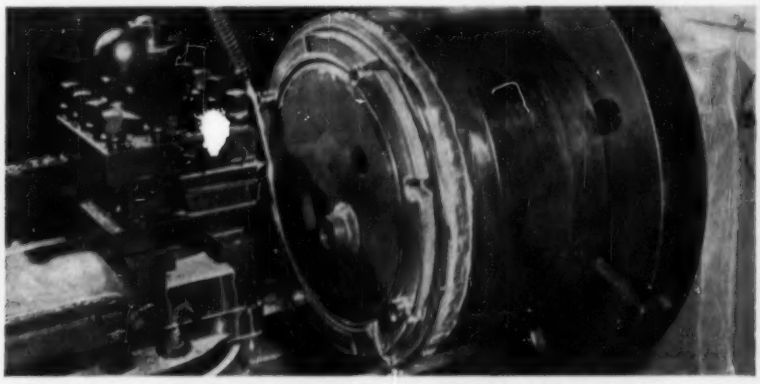
"We're sold 100% on our Axelsons because they're accurate, rigid and require very little maintenance."

Agnew W. Derbyshire Jr., Plant Superintendent
Derbyshire Machine & Tool Co., Philadelphia, Pa.



PRODUCTION PARTS. Tube head before and after machining, shows built-up nickel weld and subsequent grooves.

JOB SHOP MACHINING. Roughing off nickel weld of tube head before cutting the grooves.



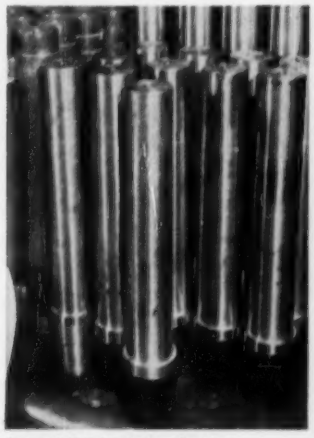
GROOVING. Double nickel weld in tube head is grooved 1/16" deep. Another groove, .046" wide and .046" deep, is cut within the first.

Pipe Mill Machinery Production Calls for Multiple Operations, Work-Horse Performance

Turning, boring, threading, drilling, tracing and die-forming are some of the operations performed by Axelson lathes at Taylor-Wilson Manufacturing Company, McKees Rocks, Pennsylvania.

In one setup, an Axelson 25" engine lathe bores, turns and faces a cast steel collet body. In another, a 20" lathe turns diameters of 55-pound roller shafts for pipe mill cutoff tables. According to August F. Carioto, Taylor-Wilson Plant Manager: "We find ease of operation, speed and accuracy the most important features of our Axelson lathes. Their performance has made Taylor-Wilson's five Axelsons the production and maintenance work-horses in the manufacture of pipe mill machinery."

ROLLER SHAFT PRODUCTION. An Axelson 20" lathe performs final cutting operation on a conveyor roller shaft. Floor-to-floor time for rough and finish cuts is 45 minutes.



PRODUCTION PARTS. Roller shafts of 1045 SAE steel are finish-turned with carbide tools.

YOU'LL FIND G.S. GEARING IN TOP QUALITY PRODUCTS LIKE THESE . . .

Adding Machines • Aircraft Instruments and Radios • Automatic Musical Instruments • Business Machines • Check Signing & Protecting Machines • Clippers for Barbers, Animal Shearing & Hedge Trimming • Cloth Cutting Machines • Coin Changers & Counters • Communication Equipment • Electric Fans • Electric Motors • Floor Polishers, Sanders, Scrubbers, Sweepers • Food & Drink Mixers, Blenders • Home Appliances • Lawn Sprinklers • Machine Tools • Meat Tenderizers, Grinders, Slicers • Military Equipment • Motion Picture Cameras & Projectors • Outboard Motors • Pneumatic Production Tools • Portable Electric Tools • Radio & Radar Tuning Assemblies • Radio Anti-backlash Gears • Record Changers • Sewing Machines • Steel Strap Stretchers • Step Switches • Tapping, Drilling & Threading Equipment • Telephone Dials • Television Sets • Thermostatic Controls • Typewriters • Vending Machines • Washing Machines.

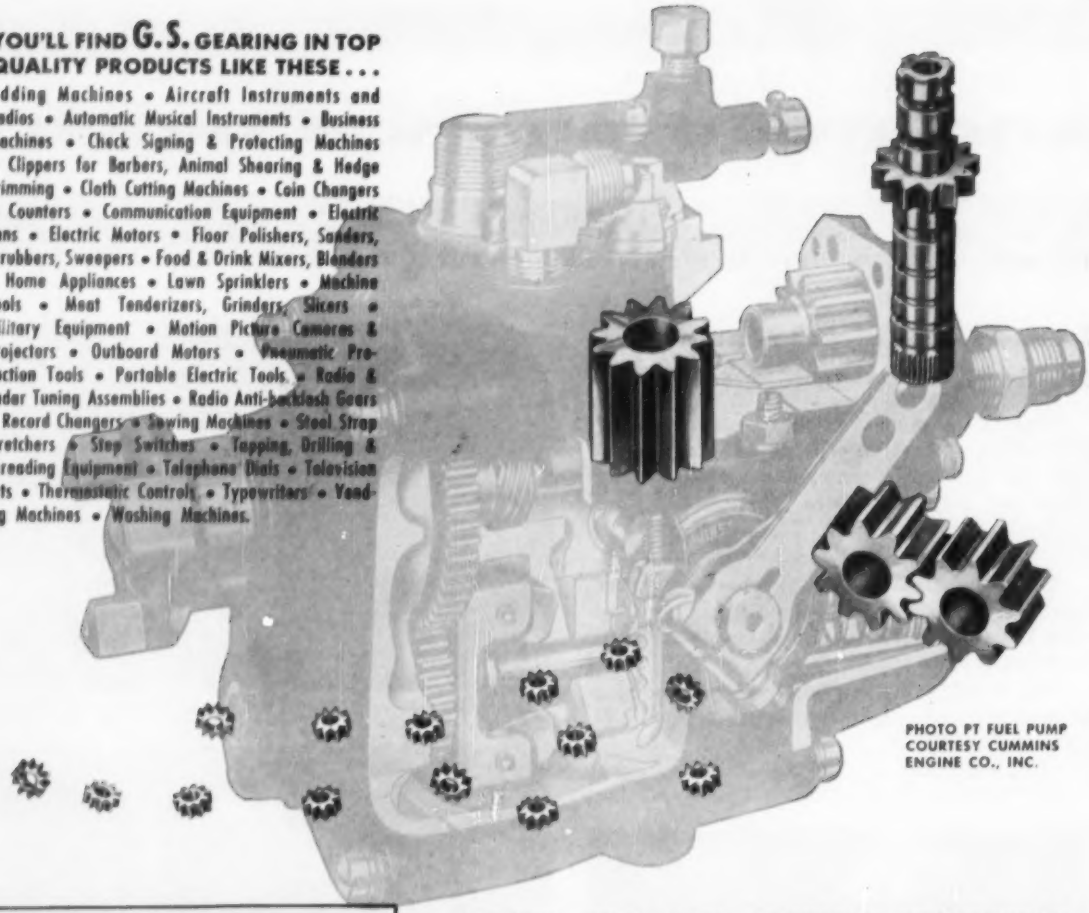


PHOTO PT FUEL PUMP COURTESY CUMMINS ENGINE CO., INC.

GEAR
Specialties, Inc.
2635 WEST MEDILL AVENUE
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DIESEL FUEL AND AIRCRAFT HYDRAULIC SYSTEMS ARE MORE DEPENDABLE WITH

G.S. SMALL GEARING

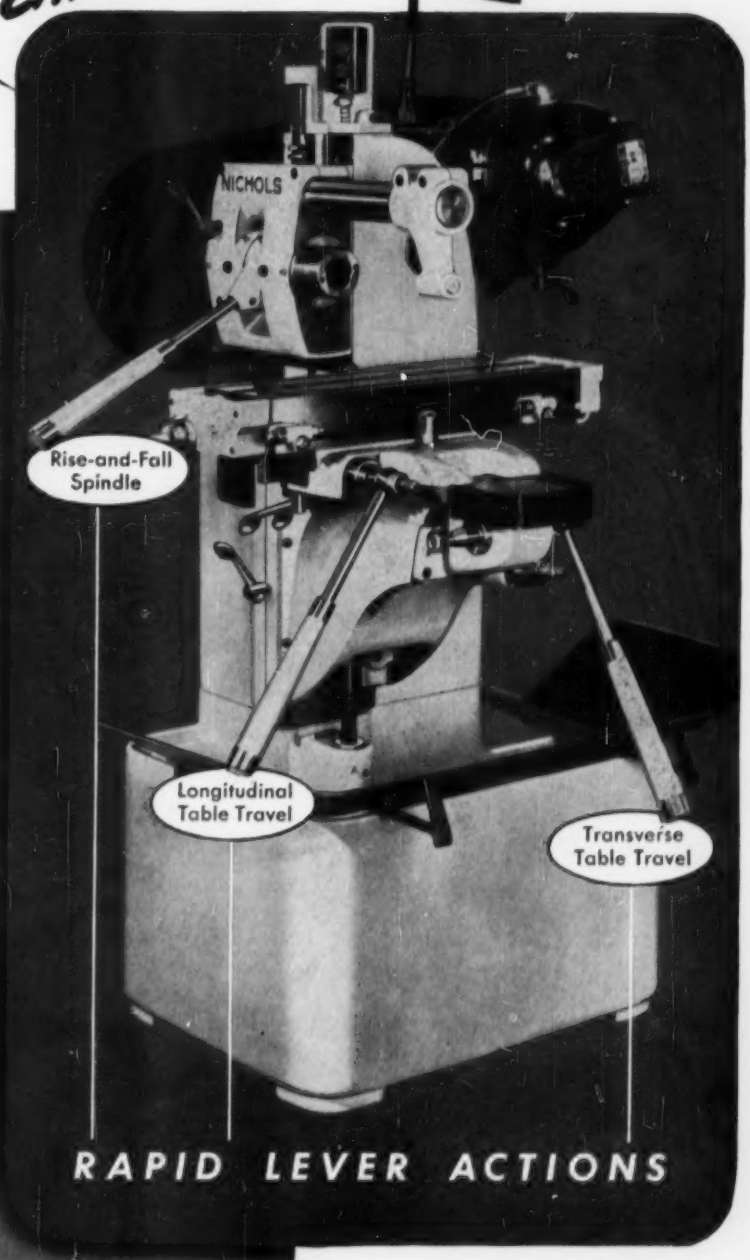
GEARING for Diesel Fuel and Aircraft Hydraulic Systems must measure up to the most rigid quality standards. Occasionally, a single, intricate component requires 40 or more extremely accurate operations. You see, Pump Gearing must function *without fail*, under *all* operating conditions. Utter dependability is essential. ★ G.S. Small Gearing is usually specified for mechanisms that perform perfectly *always*. Will YOU also join the fast-growing group of critical customers who come to "Headquarters" for *all* the Small Gearing they need? You'll find it pleasant and *profitable* to do this.

SEND FOR FREE *6-page Small Gearing Guide. It describes 80 types and applications. Contains useful charts . . a valuable aid to anyone interested in Small Gearing. Use company letterhead, please. No obligation, of course. Write today!*

FRACTIONAL HORSEPOWER GEARING

40 Years of Specializing in Small Gearing!

LATHE CARRIAGE FLEXIBILITY



Nichols Miller

PRODUCTION MODEL

Precision turning, boring and recessing jobs that are normally assigned to toolmaker's lathes or expensive boring machines, come natural to the versatile NICHOLS Millers.

Rapid Lever Actions on the Spindle Head, Table, and Saddle provide unparalleled flexibility of movements. The Lever Transverse Feed, an exclusive NICHOLS development, is especially valuable. Makes NICHOLS different from other hand millers. It adds *"lathe-carriage flexibility"* to your most intricate machining operations, while maintaining tolerances to "tenths." Work can be chucked lathe-fashion on the spindle with tools mounted on the table or vice versa.

Adjustable positive stops, quick-acting locks on sliding movements, and the highest degree of precision are standard equipment.

"THE MILLER THAT USES ITS HEAD"

Send for free illustrated brochure.

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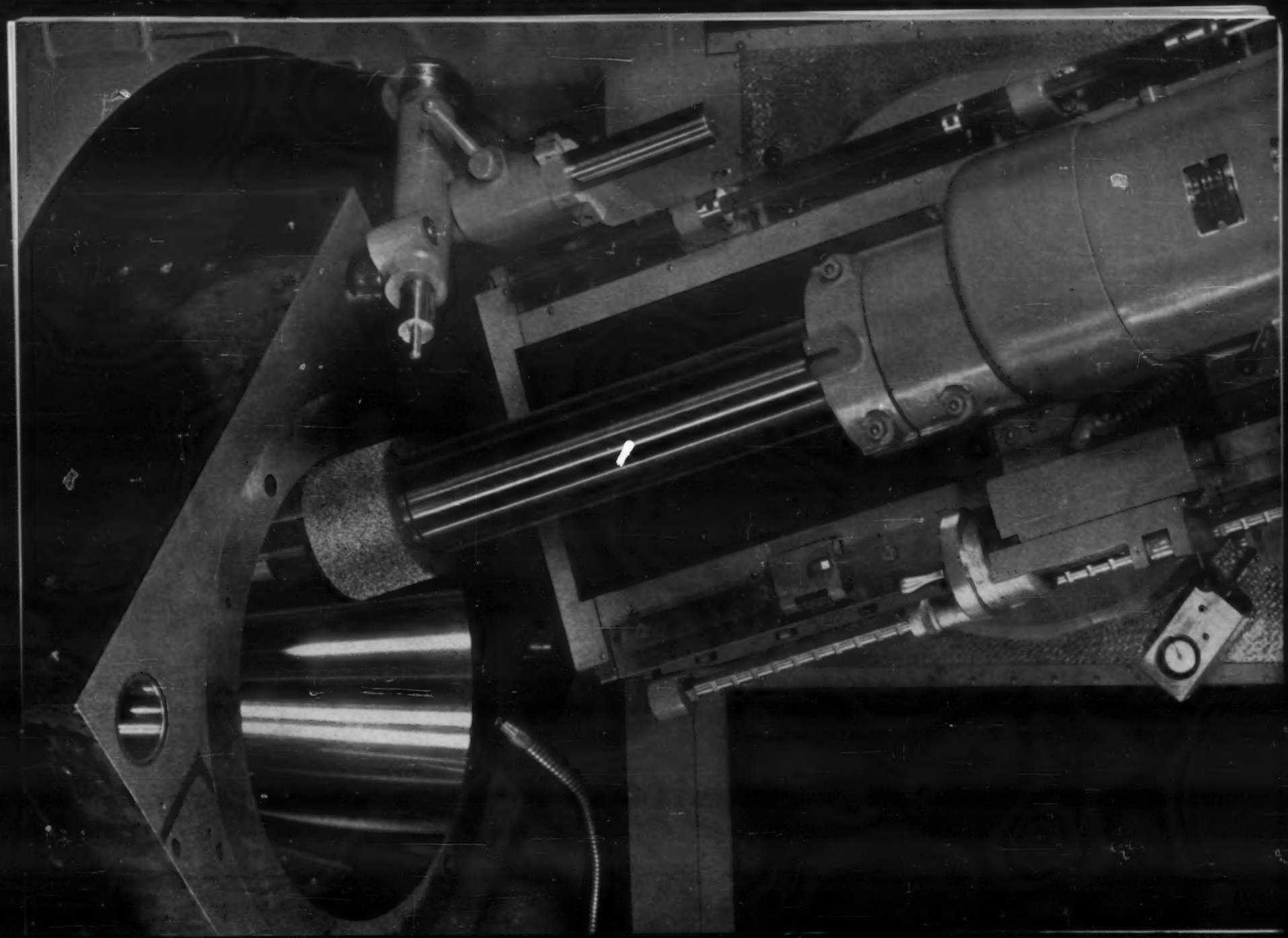
NATIONAL DISTRIBUTORS

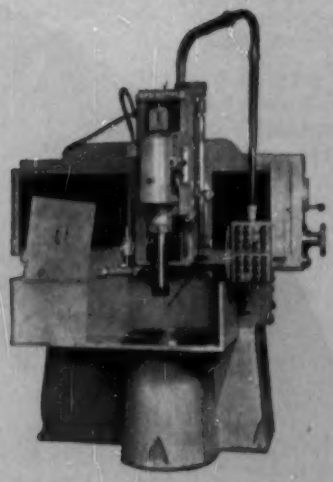
NICHOLS-MORRIS CORPORATION

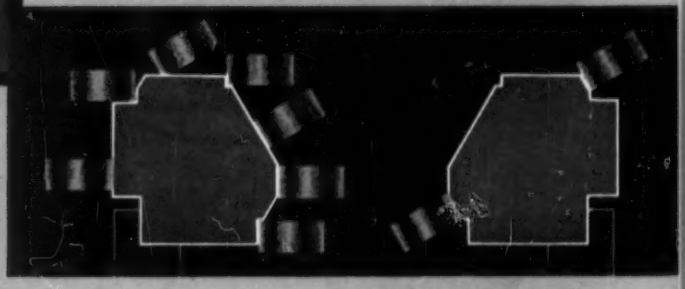
76-F Mamaroneck Ave., White Plains, N. Y.

CONDENSED SPECIFICATIONS

Table Working Surface	6¼" x 21"
Longitudinal Table Travel	10"
Transverse Table Travel	7"
Vertical Travel of Knee	13"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to	5000 R.P.M.
Weight	1250 lbs.







one setup: nine jobs

As flexible, as responsive as a dentist's drill, a Springfield Vertical Universal Grinder can reach around and into a workpiece to do nine different jobs on one chucking.

If you make a pipeline valve, a mold, a bearing race—requiring micro-inch finish on any or all the faces shown in the diagram—at whatever angle—look into Springfield. These grinders cut down the number of set-ups, frequently eliminate hand-lapping, operate with fewer work-holding devices. And, as a bonus, on jobs calling for extreme concentricity, one angle setting of the Springfield head grinds both faces of mating parts.

All three models readily adaptable to special problems.

Vertical Universal Grinders: swings 18″, 24″ and 42″.

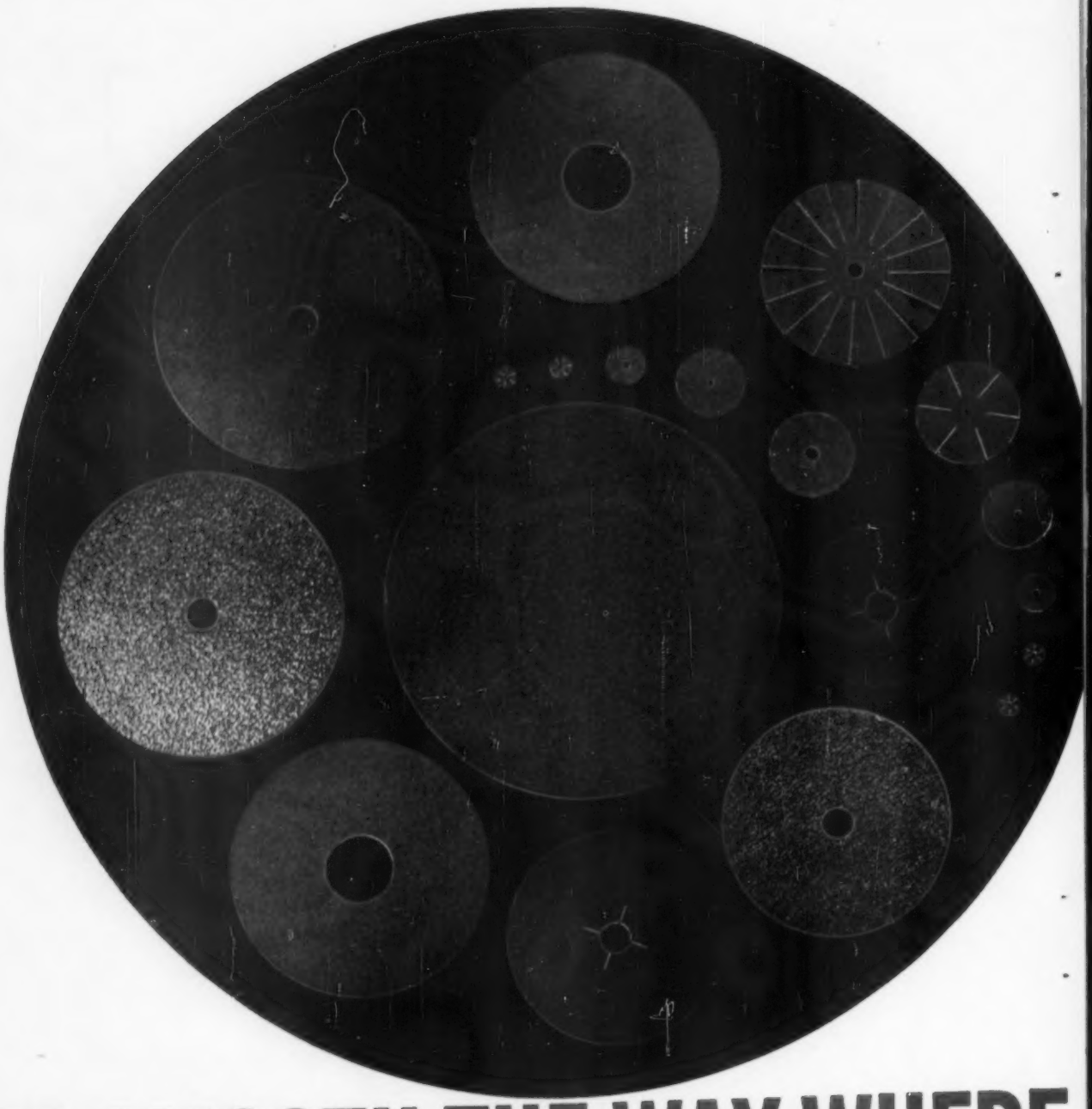
Lathes: Engine and tool room, contouring and reproducing—swings 14″ to 32″.

The Springfield Machine Tool Company

Springfield, Ohio

65TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

SPRINGFIELD



TO SMOOTH THE WAY WHERE

JEWEL BRAND GRINDING DISCS

A wider selection of grinding discs especially designed for rapid removal of excess metal as well as for fine finishing of hard or soft metal products is offered in the JEWEL BRAND line.

JEWEL BRAND Grinding Discs are made in all standard diameters and in all degrees of coarseness or fineness with vulcanized fibre, cloth or other backings coated with the world's best abrasive grains. There's a standard or special JEWEL BRAND Grinding Disc to meet every need where the use of an abrasive disc is indicated.

A COMPLETE LINE OF ABRASIVES

Abrasive Products, Inc., manufactures a complete line of JEWEL BRAND coated abrasive products — belts, rolls, sheets, discs, and specialties in a wide variety of shapes and sizes.

MODERN FACILITIES AND MANUFACTURING METHODS

Modern methods and equipment, expert craftsmen, plus carefully controlled grading by the JEWEL triple-screening process, assure uniformly-high standards of quality throughout the JEWEL BRAND line. In the plant of Abrasive Products, Inc., over 250,000 square feet of floor space is devoted to the manufacture of JEWEL BRAND abrasive papers and cloths.

SKILL PLUS WILL

You'll find that AP salesmen not only have the skill to solve problems involving the use of abrasives, but the willingness to continue to search for better ways after problems are solved. Try this combination for best results in the long run.

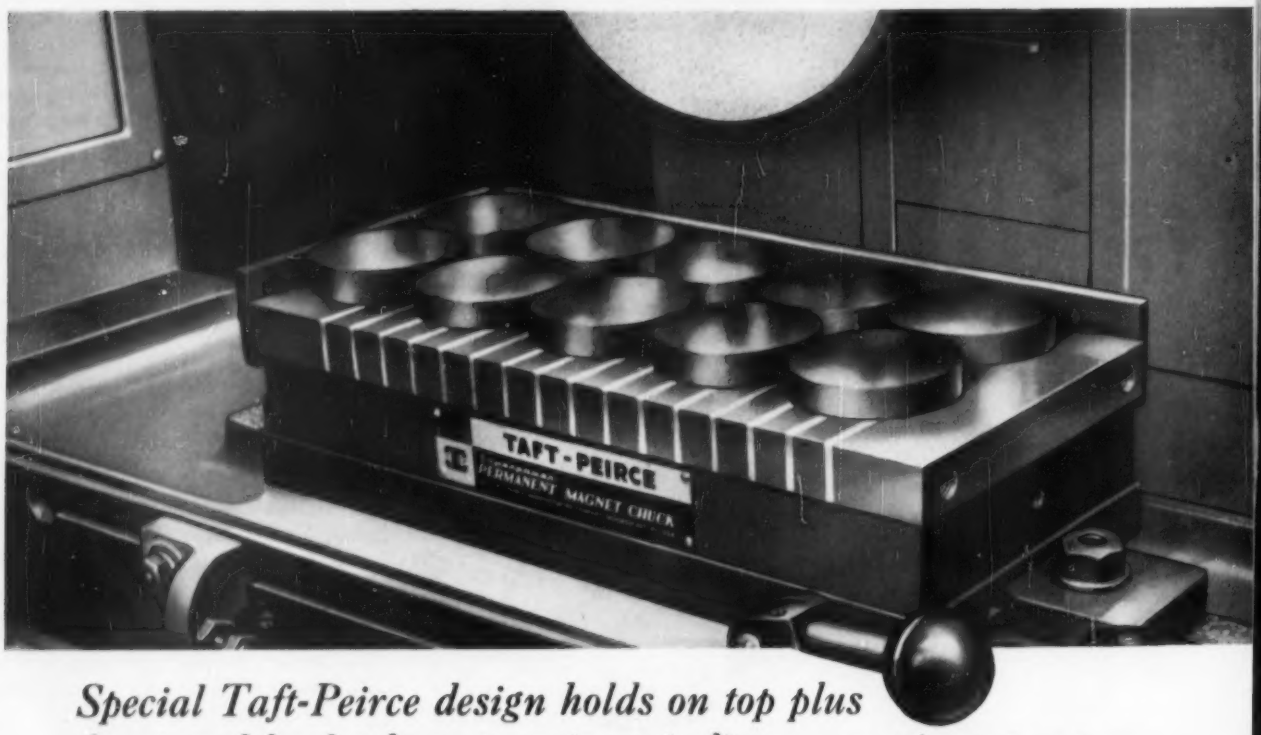
THE GOING IS ROUGH

CALL ABRASIVE PRODUCTS, INC.
South Braintree 85
Massachusetts

JEWEL JEWEL ABRASIVES **BRAND**
coated abrasives

JEWELOX • JEWELITE • JEWEL GARNET • NEW PROCESS • JEWEL EMERY • PILGRIM FLINT

The Only Permanent Magnet Chuck



Special Taft-Peirce design holds on top plus front and back edges, permits grinding more pieces per pass

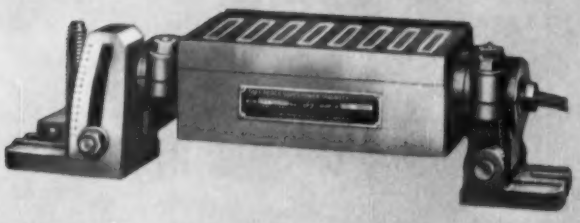
Never before have permanent magnet chucks been able to handle so many jobs! This new versatility comes from a combination of four very important design features found only in Taft-Peirce Superpower Permanent Magnet Chucks.

- Low height — increased clearance between wheel and chuck gives higher work capacity.
- Releases quickly in "Off" position — minimum of residual magnetism.
- More magnetic poles for its size — uniform pole spacing allows firm holding of smaller parts.
- Poles extend full width of face plate, no waste space or dead spots — increases capacity and simplifies setups.

Taft-Peirce offers a wide selection of electromagnetic rectangular chucks. Key features: Extra heavy concentration of magnetic flux, greater magnetic work area, all-steel, one piece construction, sealed electrical components. Result: Maximum use of energy, more even distribution of magnetic flux. There are seventy-five standard sizes, plus a very extensive line of special patterns.

Plain Face Plate Chuck (left) is a general-purpose type, used for most chucking applications. Fine Mesh Chuck (center) has closer pole spacing, holds work of very small or thin section. Longitudinal Poles Chuck (right) holds long, narrow work firmly along entire length of piece.

with 100% All-Over Holding Power



ADJUSTABLE CHUCKS

Taft-Peirce modern chuck features are also available in several standard adjustable models designed to save setup time and insure accuracy on angular grinding jobs.

Duplex Model Electromagnetic Chuck (top illustration) is a precision grinding fixture, swivels to 90° on either side of horizontal, tilts to 14°. Clamps rigidly at any setting.

Sine Angle Permanent Magnet Chucks are available in either simple or compound (lower illustration) models. Angles from 0° to 90° are set quickly and surely with standard gage blocks. Electromagnetic models can also be furnished from stock.

Permanent Magnet Chucks are furnished in sizes from 3″ x 6″ to 10″ x 15″. Check into the amazing holding power and see how it can simplify your grinding, planing, and light milling operations. Electromagnetic Chucks range in sizes from 4″ x 8″ to 36″ x 60″. Larger chucks can be assembled from these standard Superpower units.

All types and sizes of standard Taft-Peirce Magnetic Chucks are readily available. Special chucks for unusual holding applications are designed and built on request. Write for catalog on complete line of Superpower Electromagnetic and Permanent Magnet Chucks — then make sure you . . .

Tips

ON USING MAGNETIC CHUCKS

Always position work on chuck to introduce maximum magnetic flux. Flux is dependent upon the total gap length in contact with work. Setup in Fig. 1-A will hold piece firmer than setup in Fig. 1-B

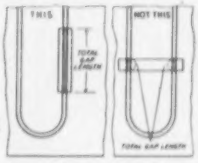
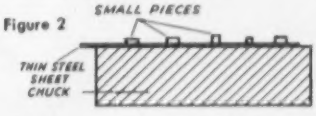


Figure 1-A Figure 1-B

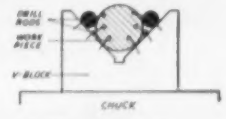
With exceptionally small pieces, place a thin steel sheet upon chuck and the small pieces on top of it, over the gaps, as in Figure 2. Steel sheet will concentrate flux through the pieces.

Figure 2



When holding round work in magnetic V-blocks on a chuck, more flux and holding power can be obtained by using appropriate sizes of drill rod to provide additional points of contact, as shown in Figure 3.

Figure 3



T-P

TAKE IT TO TAFT-PEIRCE

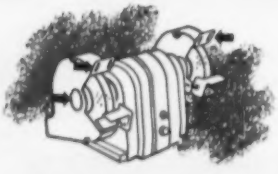
The Taft-Peirce Manufacturing Company
Woonsocket, Rhode Island

T-P Means TOP Precision

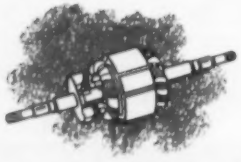
Nothing Like It For "Big Grinder"

SKIL 6"

Why SKIL Model 246 is the Finest You Can Buy:



More safety features at low price! Complete wheel guards, spark arrestors and exhaust chutes.



Fast-Starting statically and dynamically balanced motor gives vibration-free performance. Quiet, cool-running.

Self-lubrication ball bearings give continuous, trouble-free operation—save maintenance time and costs.

SKIL ACCESSORIES THAT GIVE EVEN GREATER SAFETY AND UTILITY!

Features AT LOW COST!

Model 246 Bench Grinder

FOR GRINDING, SHARPENING, BRUSHING OR BUFFING . . . IN ALL PRODUCTION AND MAINTENANCE!

Look at the advantages of this rugged, smooth-running SKIL Bench Grinder. They're usually offered only on bigger, more expensive models. Yet SKIL combines them with outstanding performance and long operating life to bring you the finest light-duty, low-cost grinder you can buy today!

Only SKIL Model 246 Grinder offers all these important big grinder safety features at low price. Wheel guards with end covers, spark arrestors and exhaust chutes, and sturdy, adjustable tool rests. And illuminated eye shields are available as optional accessories for protection and increased visibility.

For safety, for years of dependable, trouble-free service, for all grinding, sharpening, brushing and buffing jobs in the smaller shop. Flat face design permits easier handling of work and lets you reach hard-to-get-at surfaces. Also a favorite for spotting around larger plants to eliminate bottle-necks, save man-hours. Ask your distributor to show you the SKIL Model 246 Grinder now! See for yourself why it's the biggest bench grinder value on the market!

Low SKIL price—Only $58.00

⅓ h.p. 6" SKIL Model 247

Extremely powerful for its size and weight. Has all the safety features and smooth performance of Model 246. For all grinding, sharpening, buffing and wire brush work on production lines, in maintenance and repair shops and tool rooms. **Low Price—Only $68.00!**

Pedestal base for extra convenience! Storage compartment, removable water pot. Optional at small extra cost.

Solid housing of pressure die cast aluminum has maximum strength and rigidity —greater work clearance.

• Illuminated Eye Shield protects eyes, increases work visibility. *Price, $15.00 each.*

• Plain Eye Shield for extra safety! ⅛" shatterproof glass. *Price per pair, $7.00.*

SKIL PORTABLE TOOLS

Made Only by SKIL Corporation formerly SKILSAW, Inc.
5033 Elston Avenue, Chicago 30, Ill.
3601 Dundas Street West, Toronto 9, Ontario
Factory Branches in ALL Leading Cities

FREE! **Mail coupon for a demonstration and FREE trial. See why SKIL Models 246 and 247 are the finest grinders of their size you can buy *anywhere* today!**

SKIL Corporation, Dept. AM-106
5033 Elston Avenue, Chicago 30, Illinois

☐ I would like a demonstration and free trial.
☐ Please send literature on SKIL Models 246 and 247 Bench Grinders.

Name_____
Company_____
Street_____
City_____ Zone____ State____

Here's Your Best Assurance of

Higher Output Better Accuracy Reduced Costs

On Every Boring and Facing Operation . . . . .

With only two items to handle — block and taper lock screw — it takes but a few seconds to insert a Davis block in its bar and start boring.

ONLY DAVIS GIVES YOU ALL 8 OF THESE ADVANTAGES

1. *Block centers accurately in bar.*
2. *Full thrust transmitted to bar.*
3. *Readily adjusts to float boring.*
4. *Cutters rigidly locked in block.*
5. *Assure maximum range of bore sizes.*
6. *Blocks feature built-in centers.*
7. *Fore or back bore with one tool.*
8. *Quick, easy changing of blocks.*

FOR COMPLETE INFORMATION, WRITE FOR DAVIS CATALOG 304

All 4 Block Styles Fit into the Same Bar Slot

Every boring job in your shop goes faster, more accurately and shows up far better on cost records when you standardize on Davis block tooling.

Truer bores result from exclusive design features and simplified, precision construction. The unique Davis double-piloted, taper lock screw is unequalled for accurate centering of block and transmission of full boring thrust to the bar slot. Rigidly supported and locked cutters assure higher accuracy on even heaviest cuts.

Faster, more economical boring results from the complete interchangeability of the Davis block line. Four basic block styles can be used in any particular bar slot—and changing blocks is simpler and faster than any other method. Bring your boring operations up to date—write now for complete information on how Davis Interchangeable Block Tooling can save you time, money and rejects.

DAVIS

BORING TOOL DIVISION OF
Giddings & Lewis Machine Tool Co.
Fond du Lac, Wisconsin

THE ONE NAME THAT CERTIFIES ULTIMATE PRECISION AND PRODUCTIVITY IN TOOLING

Announcing...

44 ALUNDUM*

A sensational new concept in abrasive manufacture and performance

by NORTON ABRASIVES

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

MEET the New...

44 ALUNDUM abrasive

...a revolutionary Norton development for new "TOUCH of GOLD" economy in a wide range of grinding jobs

You Can SEE The Difference! The new Norton 44 ALUNDUM abrasive (right in illustration) differs radically in appearance from ordinary aluminum oxide abrasive as you can see from the 2 pieces shown here. The finer grain structure of "44" indicates its much denser, tougher composition. And the money-saving performance of this modern new abrasive is just as easy to spot — every time 44 ALUNDUM wheels go to work for you.

In new 44 ALUNDUM abrasive Norton brings you a combination of grinding quality, versatility and economy that has never before been equalled in a non-premium abrasive.

We want to emphasize that point. Although 44 ALUNDUM is non-premium priced, right there its resemblance to any regular aluminum oxide abrasive ends abruptly. It is definitely different and better in every way.

"44" is made differently, by a special, Norton-developed, electric furnace process that results in extreme toughness and ruggedness. This makes "44" the top performer for heavy duty grinding.

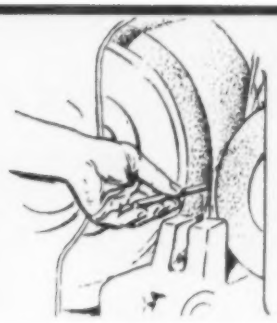
"44" performs differently. Compared to other non-premium priced aluminum oxide abrasive wheels, the new 44 ALUNDUM wheels cut faster, grind cooler and last longer. They hold form better, finish better and give more pieces per dressing. These are your "Touch of Gold" advantages that improve product quality, while reducing grinding time and costs.

"44" does more jobs. While not a cure-all, this new abrasive is a topnotch performer in widely varying types of grinding. For example:

PRECISION GRINDING	ROUGH GRINDING
CENTERLESS	SNAGGING
INTERNAL	WELD GRINDING
CYLINDRICAL	BILLET GRINDING
THREAD GRINDING	DISC GRINDING

MOUNTED WHEELS

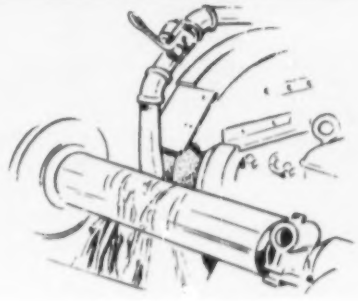
Proved In 1100 Tests. Before being offered to industry, 44 ALUNDUM wheels had the thorough testing given to every new Norton product. Over 1100 different tests were made — throughout the country and across "44's" entire job range. Here are some typical test reports:



CENTERLESS GRINDING

Job: Steel bushings. *Report:* "Faster cut, longer life and better finish."

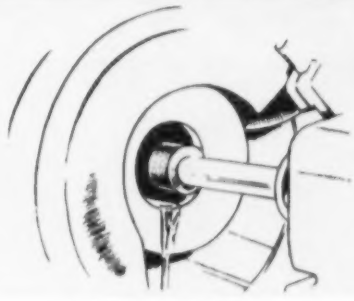
Job: Miscellaneous parts. *Report:* "44 ALUNDUM wheels much more versatile for different materials and set-ups. Time cut on one 14-hour job to 10 hours."



CYLINDRICAL GRINDING

Job: High speed steel dies. *Report:* "More pieces per dressing, cooler cutting, 30% longer life. Best wheel ever used."

Job: Miscellaneous steel parts. *Report:* "10% more pieces per dressing and 10% longer wheel life."



INTERNAL GRINDING

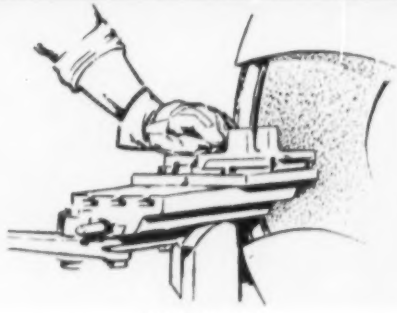
Job: Heavy duty hardened steel bushings. *Report:* "Even breakdown with excellent cutting action and less glazing. Half the dressings required with previous wheel."

Job: Steel gear housings. *Report:* "44 ALUNDUM wheels freer cutting, hold form better with less dressing and improved finish."

SNAGGING

Job: Offhand snagging, welded iron sections. *Report:* "80% longer wheel life and much faster cut."

Job: Offhand grinding steel parts. *Report:* "Faster cutting, better finish, much less burn."



DISC GRINDING

Job: Coil springs. *Report:* "Production increased from 100,000 to 125,000 springs."

Job: Stainless steel castings. *Report:* "Freer cutting, less burr and longer disc life."

MOUNTED WHEELS

Job: Snagging cast steel. *Report:* "Faster cut and 30% longer wheel life."

Job: Deburring steel welds and stampings. *Report:* "Four times longer lasting, with equal rate of cut."

Adding Up

Anything you can grind with non-premium priced aluminum oxide abrasive you can grind with 44 ALUNDUM abrasive — in every case at least equally well, in most cases a great deal better.

And you can do *more* jobs with tough, versatile "44". A real workhorse abrasive, it delivers thoroughbred performance that means more and better grinding for less money.

44 ALUNDUM wheels are available in all the popular Norton bonds. Already these new wheels are solving a lot of grinding problems, for a lot of users. How about letting them tackle yours — right now?

See Your Norton Distributor for further facts. Or write to the nearest district office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

NORTON

ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives Sharpening Stones • Behr-cat Tapes

On preceding pages you've read the benefit story of a great new Norton product. Here is . . .

The service story behind the new 44 ALUNDUM abrasive

"NORTON CITY"—ABRASIVE CAPITAL OF THE WORLD, contains over a mile of buildings, housing the most modern equipment ever devised for producing grinding wheels and other abrasive products. Here, too, 180 technicians in 19 specialized laboratories maintain Norton's long leadership in research and development. From this leading source of abrasive progress have come many news-making "firsts" — to which new 44 ALUNDUM abrasive is the latest addition.

COMPLETE STOCKS, STRATEGICALLY LOCATED. Gigantic stockrooms in the Worcester plant hold products totalling over 500,000 different grinding combinations. Norton warehouses are located in important industrial centers. Both the Worcester stockrooms and the regional warehouses carry generous supplies of the new 44 ALUNDUM wheels. And your Norton Distributor is careful to keep his own stocks — including 44 ALUNDUM wheels — fully adequate to the needs of his area.

Your Norton Distributor, one of over 315 in the United States alone, is your direct connecting link with the largest, most efficient service and supply system in the entire abrasive field. He can serve you in many important ways. For example:

- *The world's broadest line of abrasive products to choose from.*
- *Practical aid in any grinding problem.*
- *And for unusual problems he can always call in a Norton Abrasives Engineer.*
- *Prompt deliveries — and emergency deliveries to help you avoid costly shut-downs.*

Ask him for details on how the new 44 ALUNDUM wheels can bring you the product-improving, profit-boosting "Touch of Gold". Or write your nearest Norton district office.

NORTON
ABRASIVES

Making better products... to make your products better

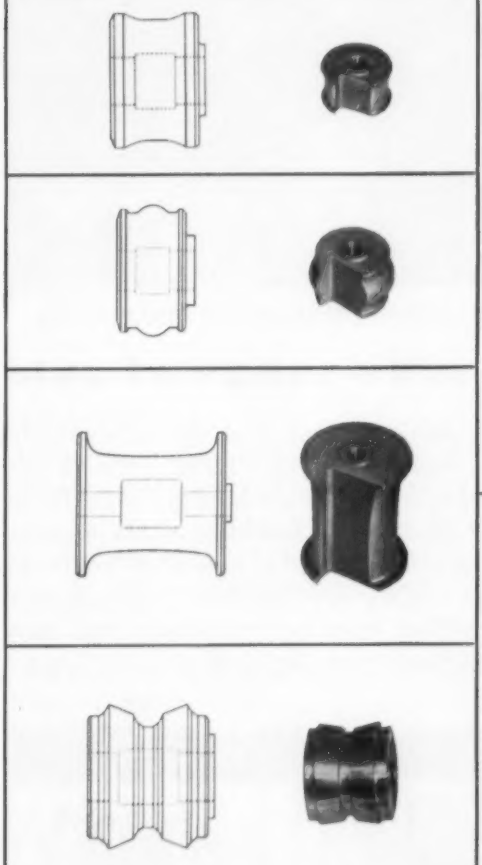
W-1735
8-56

Machining time—cut 40%!

Grinding time—cut 50%!

Grinding wheel cost—cut 25%!

HERE'S TOP FORM TURNING!



Wouldn't you welcome savings like these? S. K. F. Industries, Inc. does, and their happy secret is shown above in an action shot of their Monarch 16" Series 61 Lathe with Keller controls turning circular form tools from the solid. The figures contrast present against previous production on conventional machines, so widely and wastefully used for this work.

Point is, instead of leaving large amount of stock for final grinding, S. K. F. finds that accuracy of new Monarch with Keller controls enables them to turn and shape directly from the solid within about .0005" of finish size. And less-skilled operators can machine them faster—before less grinding.

You can't miss savings like these! Challenge us to deliver you better production whatever you turn—and prove it . . .
The Monarch Machine Tool Company, Sidney, Ohio

♦ While flat templates are generally employed with Keller controls, S. K. F. achieves the necessary high accuracy by so positioning master work pieces between centers that stylus follows sharp edge of gash in form tool master. Another savings.

Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE
FOR A BETTER TURN FASTER
. . . TURN TO MONARCH

HERE'S

new

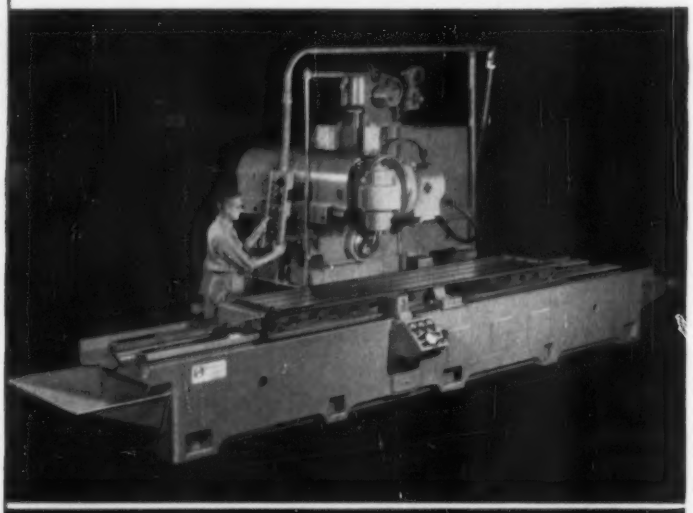
ALL-ANGLE

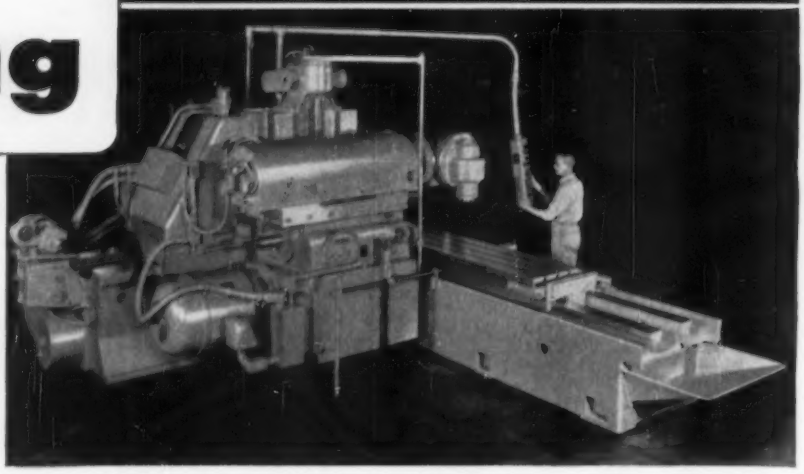
Power

IN

Milling

Below, front view of machine showing operator's position.





Above, note massive construction of column and head assembly.

NEW Sundstrand Universal Bed-Type Milling Machine has rigidity and power for wide range of cuts

If you want to get a lot of milling done on one machine, get the facts on this new Sundstrand Rigidmil. For instance, it has both a horizontal spindle head and an all angle ram type head.

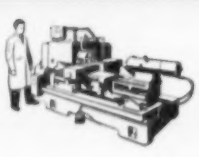
Twenty-four possible speed changes are available on both heads in a range from 14 to 1540 RPM with changes made from a selector switch on the control pendant. With the main spindle the HP range is 1 HP per RPM up to 50 HP max. and with the all angle head ½ HP per RPM up to 20 HP max. The flexibility of this machine in taking a wide range of cuts at all angles is illustrated on the opposite page. If you want a lot of milling from one machine, check into this new Sundstrand Rigidmil.

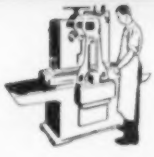
SUNDSTRAND

*"Engineered Production" Service**

*REG. U.S. PAT. OFF.

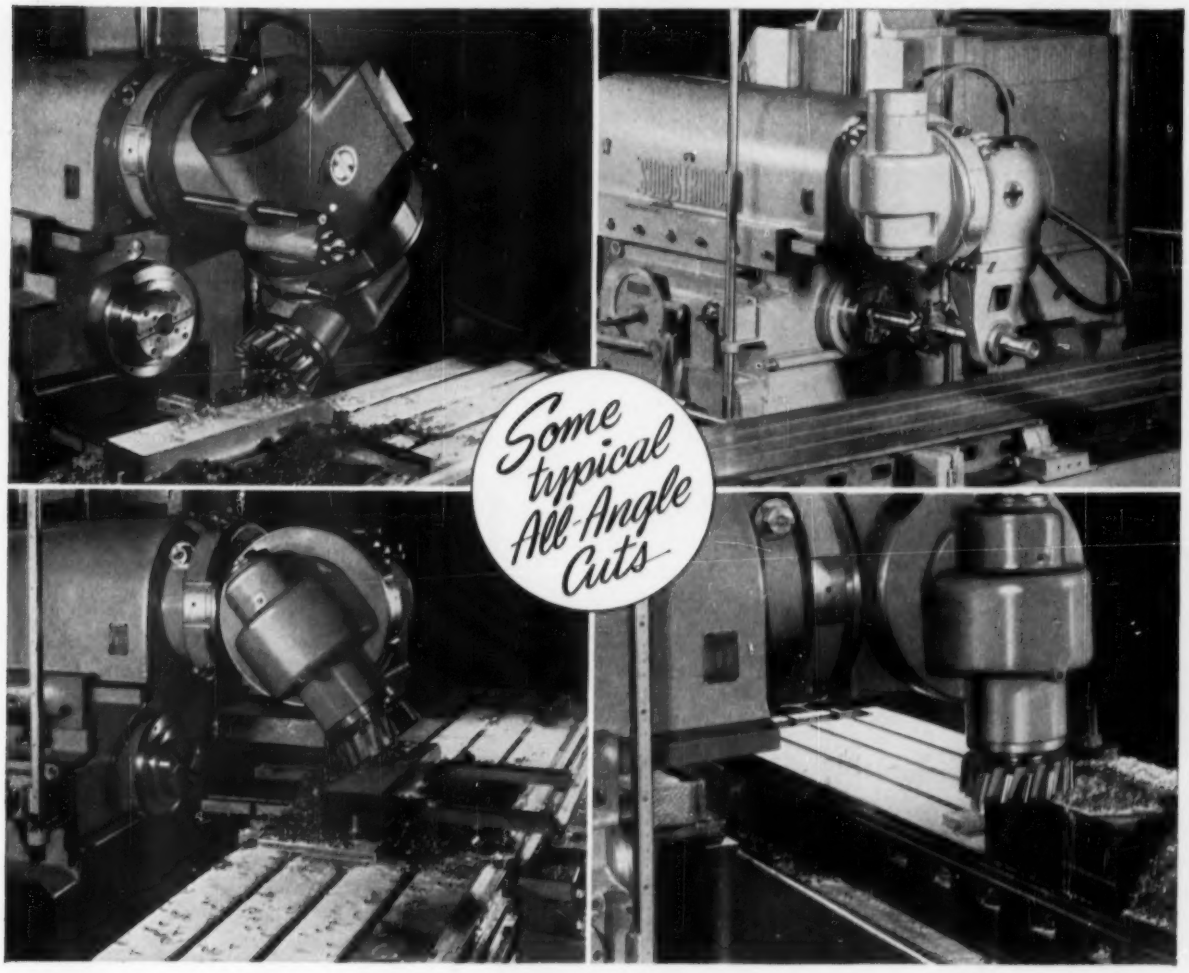
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





Below, angle cutting using cross feed of column.

Below, main spindle with arbor support for gang or slab milling.

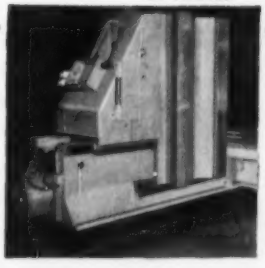


Above, angular milling using longitudinal feed of table.

Above, vertical face milling using longitudinal feed of table.

FEATURES

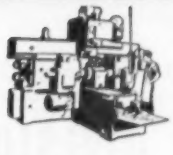
Here are only a few of the many features of this heavy duty all-angle Rigidmil.

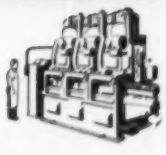


1. Heavy column, illustrated, has third way for support of head ways.
2. Scales and verniers provided for column, head and table positioning.
3. All-angle head has dovetail mounting surfaces for supports for arbor milling.
4. Meters are provided to indicate per cent of full load current on spindle motor and all feed rates.
5. Machine is controlled from a single suspended pendant with selector switches to operate all machine movements and speed and feed selection.
6. Machine can be furnished with table widths of 24", 30" or 38" and table feed stroke up to 216".

Additional Data will be sent upon request, write today.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

CINCINNATI
BICKFORD
SUPER SERVICE
Radials

For faster metal drilling . . .

This ultra-modern head . . . CHARTS and PRE-SELECTS PROPER SPEEDS and FEEDS

You chart, you control, you speed up operations and have a record for reference with this advanced head. The prescheduling chart plans sequence of operations and is a complete guide for the operator. Instant, quiet, hydraulic selection and changes of 36 speeds and 18 feeds are preselected by two convenient, easily read dials. Controls for clamping of column, arm and head, and arm elevation by power are at the operator's finger tips.

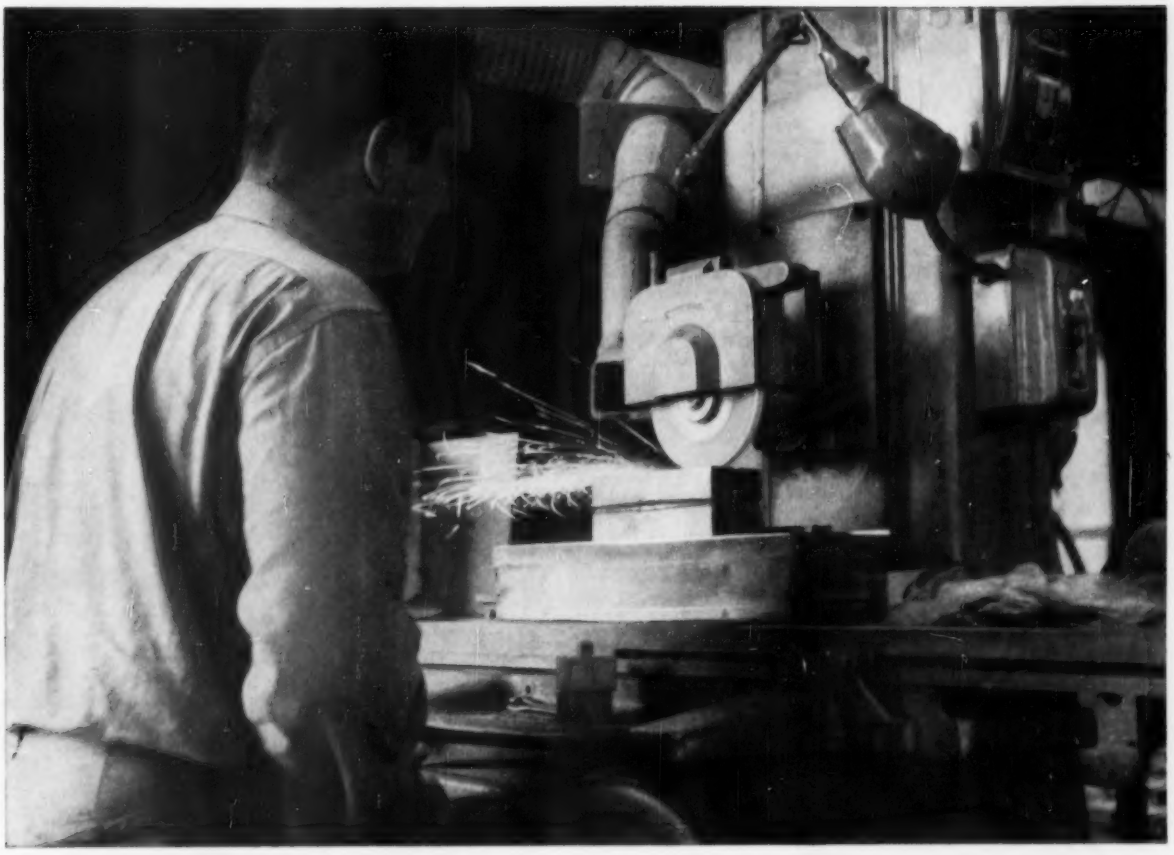
Built in 4 foot to 8 foot arm, 13 inch to 19 inch column. Spindle speeds may be as low as 8 RPM or as fast as 1750 RPM.

Write for Bulletin R-33 describing this ultra-modern tool

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

CINCINNATI BICKFORD DIVISION
GIDDINGS & LEWIS MACHINE TOOL COMPANY
OAKLEY, CINCINNATI 9, OHIO, U.S.A.



"5 years ago Cities Service solved all our lubrication problems and we've never had another!"

A report from Banner Spring & 4 Slide Co., Van Dyke, Michigan

These Were The Problems 5 Years Ago: Banner Spring & 4 Slide Company, maker of small parts for the automobile, electrical and refrigeration industries, was having trouble. Ways, bearings, and drive shafts on 4 Slide machines were getting insufficient film strength from lubricants and constantly burning out. Likewise, compressors were also running hot, and there was complete puzzlement over what type of lubricant to use for Banner's high-speed sewing machines.

Banner decided to call in a Cities Service Lubrication Engineer. A thorough survey followed, with the man from Cities Service carefully examining each machine and its particular operating conditions.

This completed, he made his recommendations — Trojan H-2 Multi Purpose Grease for the 4 Slide machines, Pacemaker No. 1 Oil for the compressors, and Pacemaker 00 Oil for the high-speed sewing machines.

Banner followed these recommendations to the letter. Result: Not one lubrication problem in the past five years — despite the fact that machinery runs 24 hours a day!

If you're faced with a lubrication problem — or if you're just not sure if your present lubricant is best for the job — talk with the man from Cities Service. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

SOME BANNER PRODUCTS: The firm makes all kinds of round wire forms, wire springs, metal clips and flat springs. Use for such products ranges from auto fender support rods to "burlap listings"—the wire frames sewn into burlap which back up automobile upholstery.

CITIES SERVICE

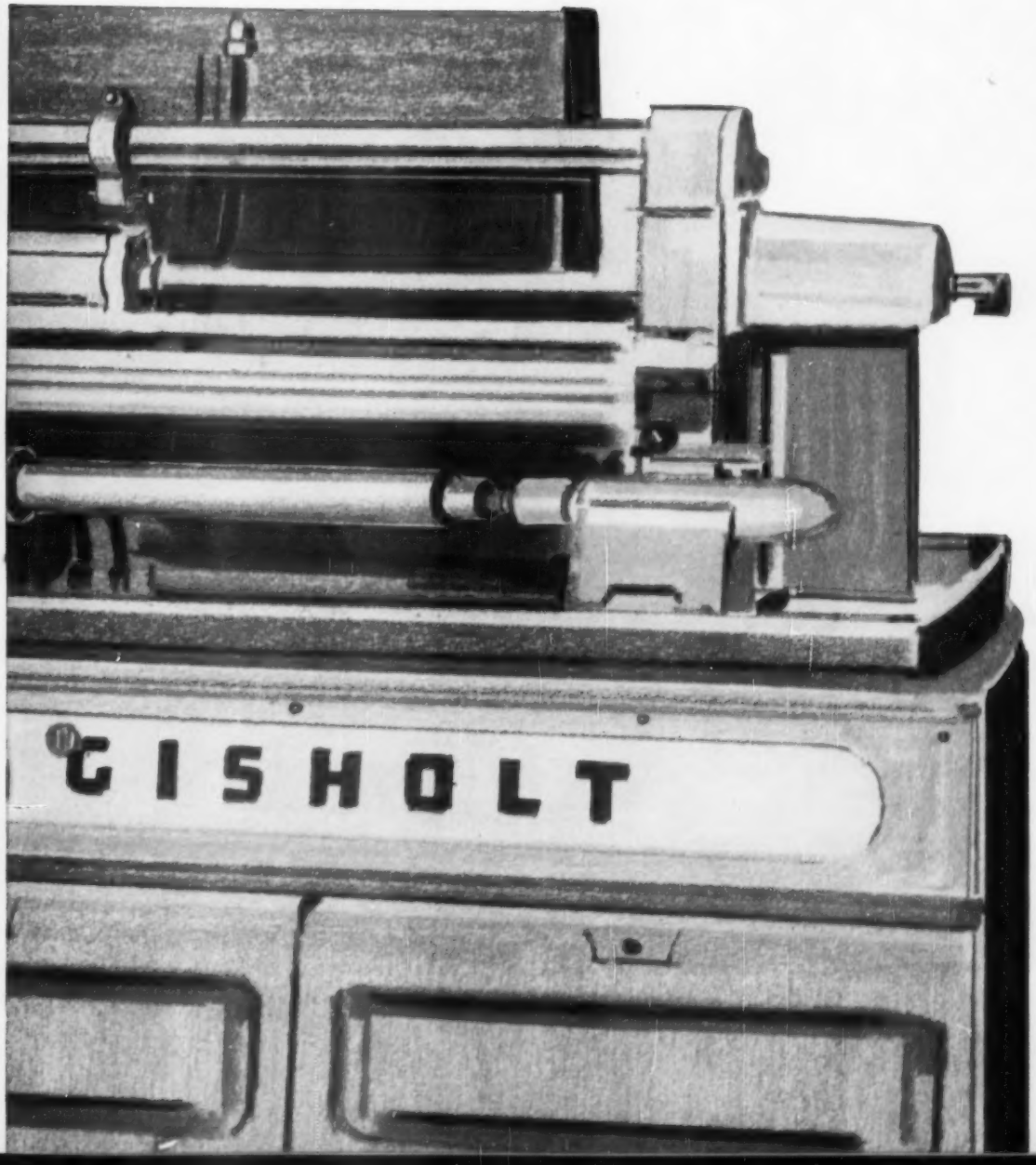
QUALITY PETROLEUM PRODUCTS

Superfinisher

GISHOLT MASTERLINE 52A SUPERFINISHER

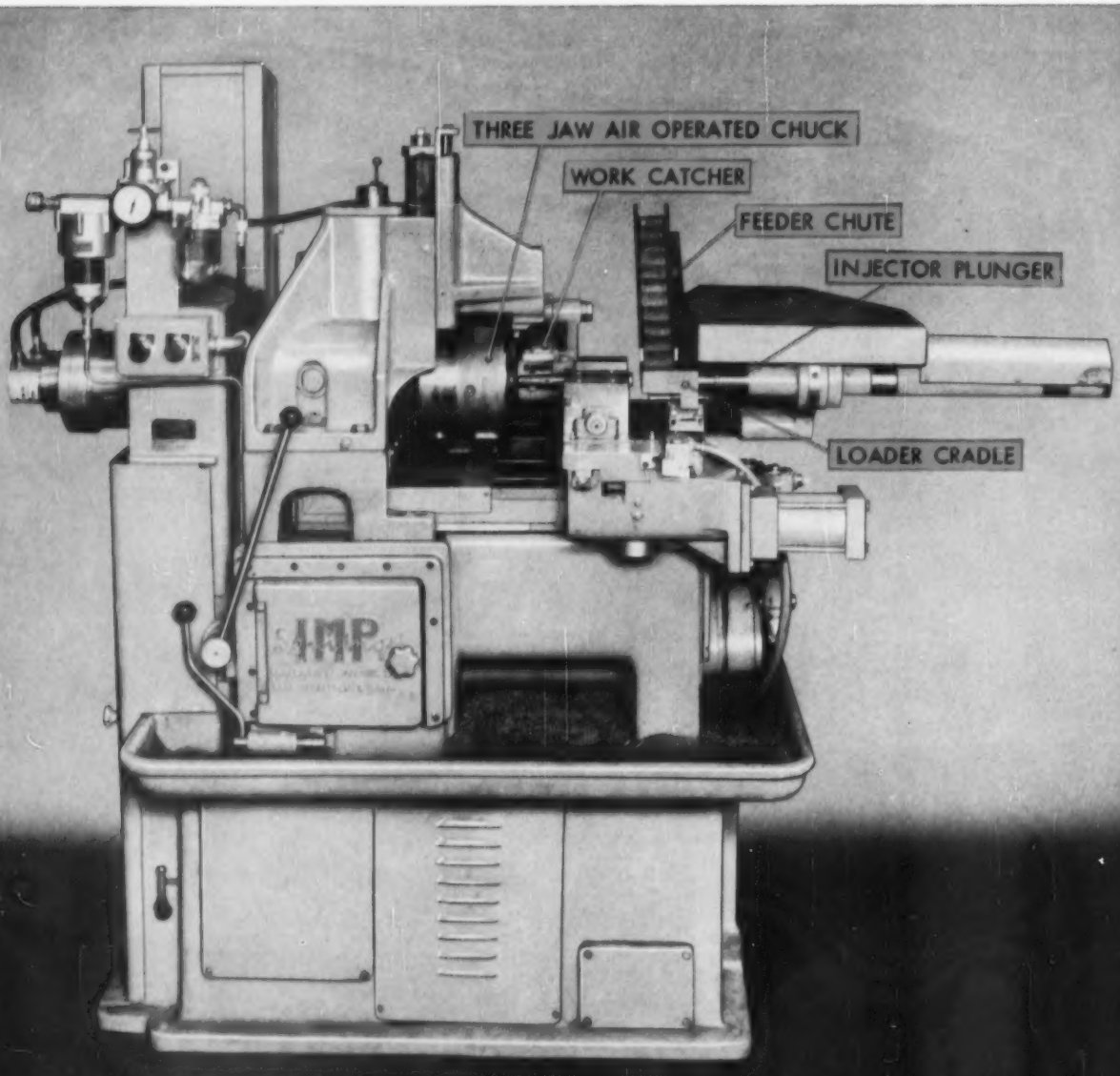
The Superfinishing process is recognized as one of the most important contributions to modern metalworking. Now—in this new 52A MASTERLINE Superfinisher—Gisholt offers an outstanding machine for either small job-lot work or high production runs. Other general purpose and high production models complete the line. Let us give you the complete facts on how Superfinishing may be profitably applied to your manufacturing processes—plus full details on the complete line of Gisholt Superfinishing Machines.

Gisholt Machine Company, Madison 10, Wisconsin
Look ahead—keep ahead—with Gisholt



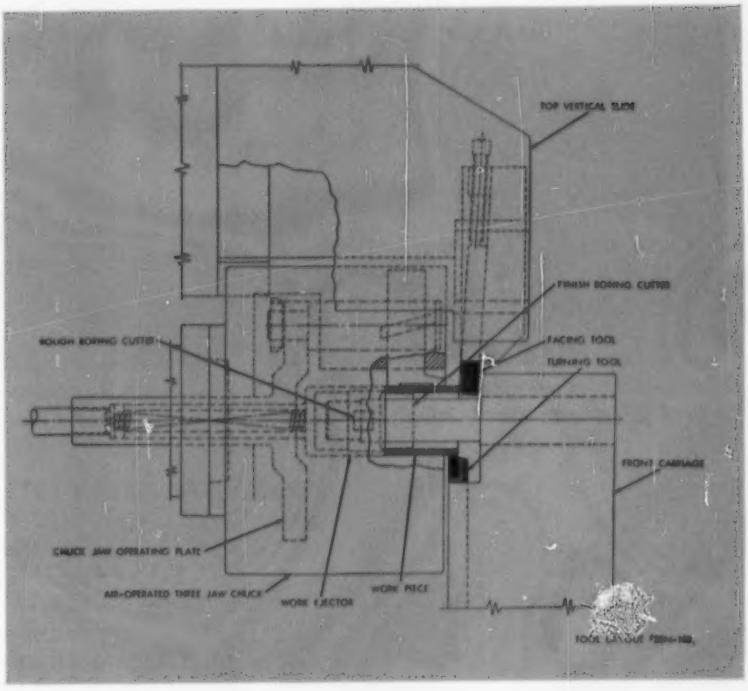
MACHINE OF

So-swing IMP AUTOMATIC LATHE MACHINES CAST IRON SLEEVES AT A FAST PACE



PRODUCTION COSTS

THE MONTH



PROBLEM: To bore, face and partially turn cast iron sleeves on a full automatic cycle including loading and unloading.

SOLUTION: A Lo-swing IMP Automatic Lathe was selected for this job due to its rigidity, compactness and productivity when equipped with Seneca Falls Automatic Injector Type Work Handling Equipment.

The cast iron sleeves, 1-13/16" in diameter and 2" long, are delivered at the machine direct from the foundry and are placed in the feeder chute where they flow by gravity into a loader cradle. In this position, the sleeves are picked up, one at a time, by the pneumatically operated injector plunger, and injected into the three-jaw air-operated chuck. The injector plunger remains in the advanced position until the chuck jaws automatically close, and then retracts to the relieved position.

The machining cycle starts with the Front Carriage and Overhead Slide tools approaching the work piece in rapid traverse. They then slow down to feed and finally return to the starting position in rapid traverse. Upon completion of the machining, an automatic work catcher swings forward, the chuck jaws are retracted and the work piece is ejected into the iron hand by means of the spring-loaded work ejector shown in the line drawing. The work catcher is then retracted and the finished piece drops into the unloader chute at the rear of the machine.

The entire operation is fully automatic, and a production of 147 pieces per hour is easily maintained. Our engineers are at your service to solve your automatic machining problems. Write for Bulletin N50A.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

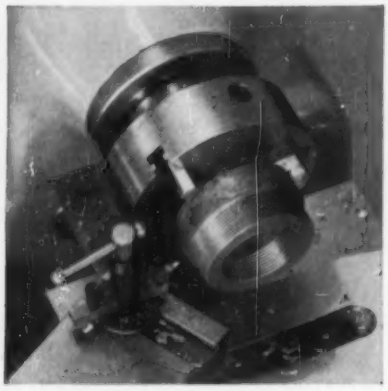
ARE LOWER WITH *Lo-swing*

HARDINGE
ELMIRA, N.Y.

"The Outstanding Tool Room Lathe"

Precision Collet work for all sizes to 1-1/16". Collet seats *directly* in spindle.

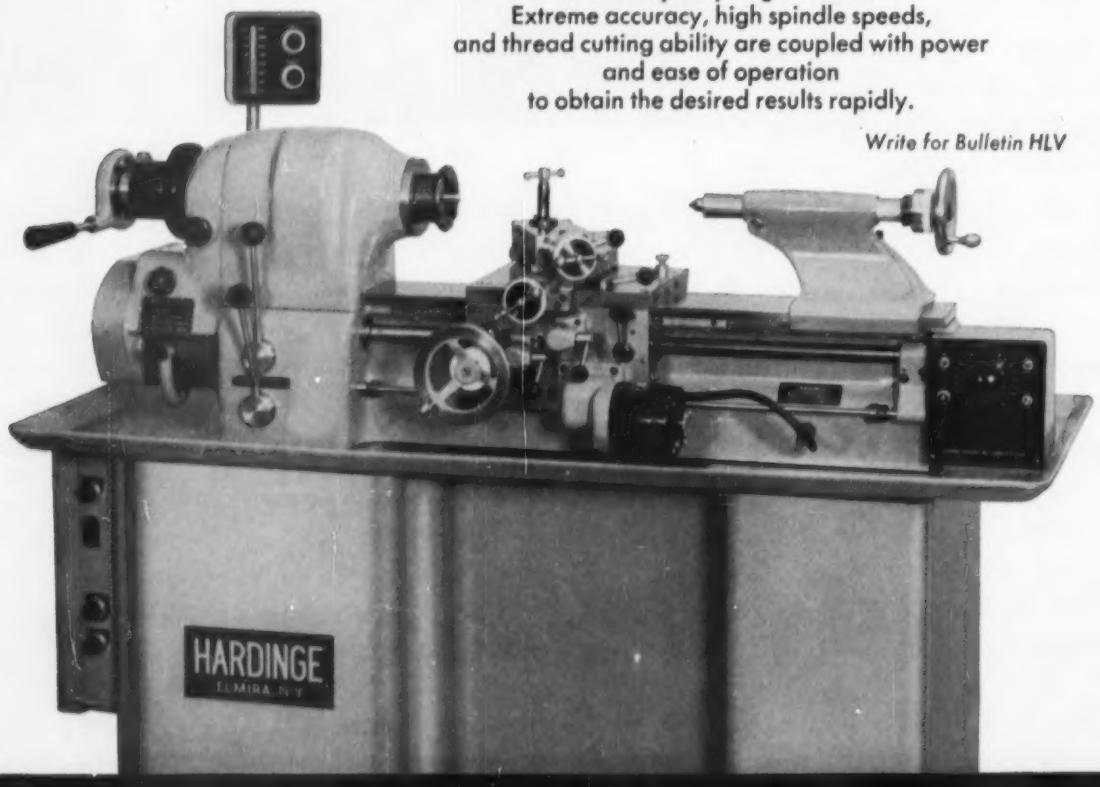
Precision Step Chucks for diameters up to 6". Provides Collet-like accuracy.



Integral Mount Jaw Chucks for precision holding of regular or irregular shapes up to 5".

Hardinge Model HLV 10" Lathe was primarily designed to fill a very old existent gap between the plain precision bench lathe and the heavy duty engine lathe.
Extreme accuracy, high spindle speeds, and thread cutting ability are coupled with power and ease of operation to obtain the desired results rapidly.

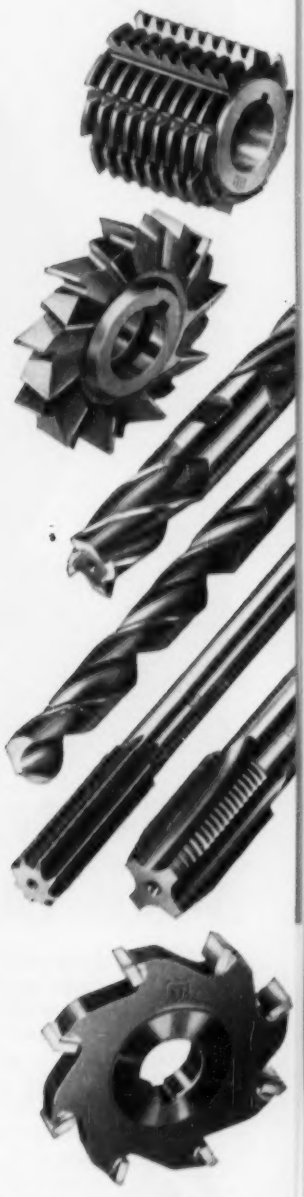
Write for Bulletin HLV



HARDINGE BROTHERS, INC., ELMIRA, N. Y.

OFFICES IN PRINCIPAL CITIES. Export Office: 268 Lafayette St., New York 12, N. Y.

Standardize with STANDARD



YOUR STANDARD TOOL DISTRIBUTOR STOCKS THE COMPLETE LINE

● Helping you solve tough metal-cutting problems, speed up production, cut tool costs...these are the **STANDARD TOOL MAN'S** services to you.

His recommendations have 75 years of industrial experience behind them and are yours without obligation.

Call him!

SERVING INDUSTRY 75 YEARS 1881-1956

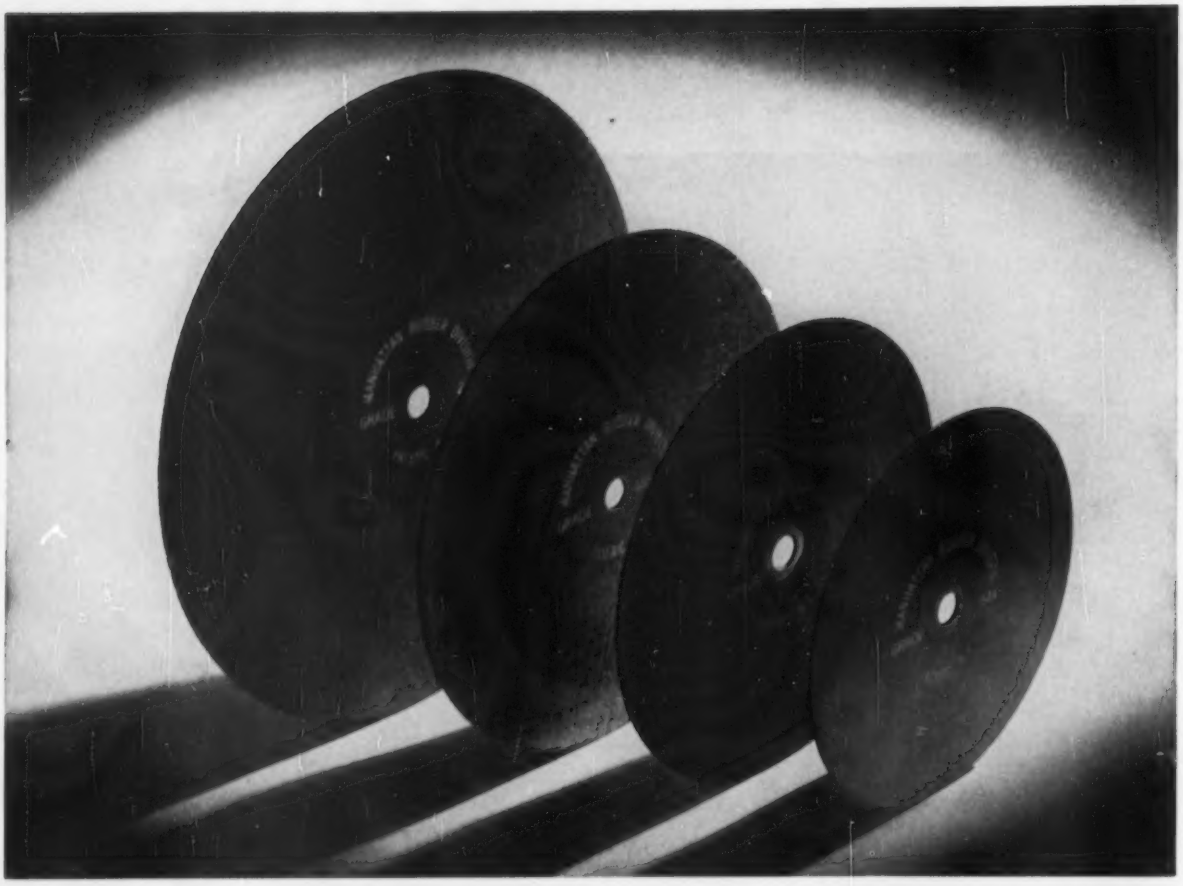
STANDARD TOOL CO.

3950 CHESTER AVENUE — CLEVELAND 14, OHIO

STANDARD TOOL CO.

FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Carbide-Tipped Tools · Gages*



Cleaner Cutting . . . Longer Wheel Life with MANHATTAN CUT-OFF WHEELS

Safe, fast, clean cutting over sustained periods saves you both time and money. Manhattan Cut-Off Wheels give you cleaner cutting at higher speeds because every wheel is custom-bonded for your specific cut-off job . . . whether you work with hardened or soft steel, light gauge tubing or critical alloys. New Manhattan developments in both rubber and resinoid bonds account for this greater cutting efficiency . . . and longer life for the wheels. In factories where records are kept of the number of cuts per wheel, Manhattan wheels have proved they do a better job . . . and *last longer* than any other wheels.

Manhattan Cut-Off Wheels are custom-manufactured for your requirements in the widest range of types and sizes. Manhattan Abrasive Wheel engineers will assist you in specifying the exact construction to improve cut-off operations at your plant. They'll show you how you can save time and money . . . get "More Use per Dollar" . . . with Manhattan Cut-Off Wheels and other types of high speed, heavy duty wheels.

RM-630

WRITE TO ABRASIVE WHEEL DEPARTMENT

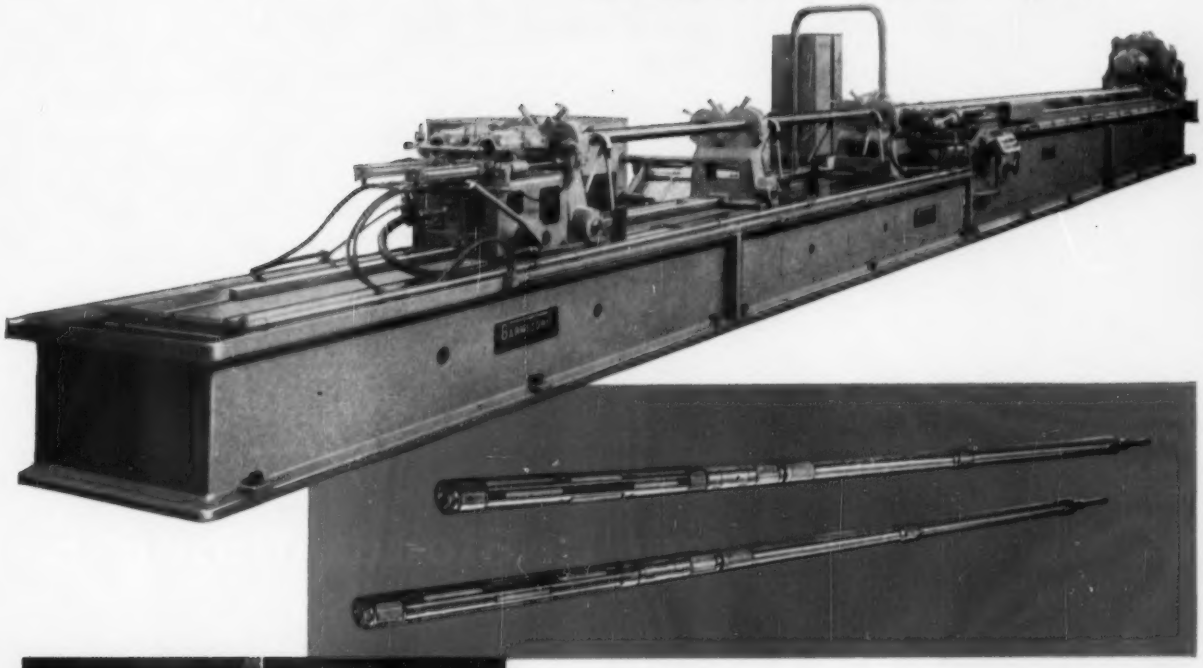
MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

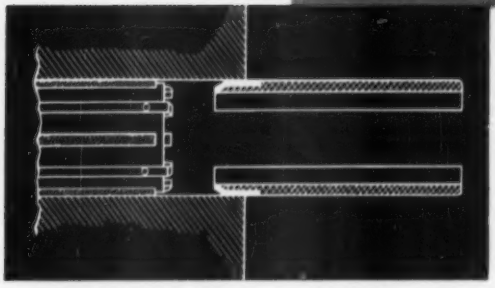
RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Laundry Pads and Covers • Bowling Balls

hold size on 2 tubes at once

Plug-matic Sizing automatically holds size on both bores within .0005"





Plugmatic sizing member enters bore from end opposite honing tool.

This manufacturer of Oil Well equipment hones pump cylinder liners up to 21 feet long, ranging from 1" to 4" diameter on this BarnesdriL Horizontal Honing Machine. Two liners are honed simultaneously and size on both bores is held within .0005"' on diameter.

Such accuracy is not unusual for BarnesdriL Honing equipment, but Barnes Drill Co. is the first horizontal honing machine manufacturer to hold size on more than one bore simultaneously. This is accomplished through BarnesdriL Plugmatic Sizing, using triple bank BarnesdriL Honing Tools with quick-mounted stones.

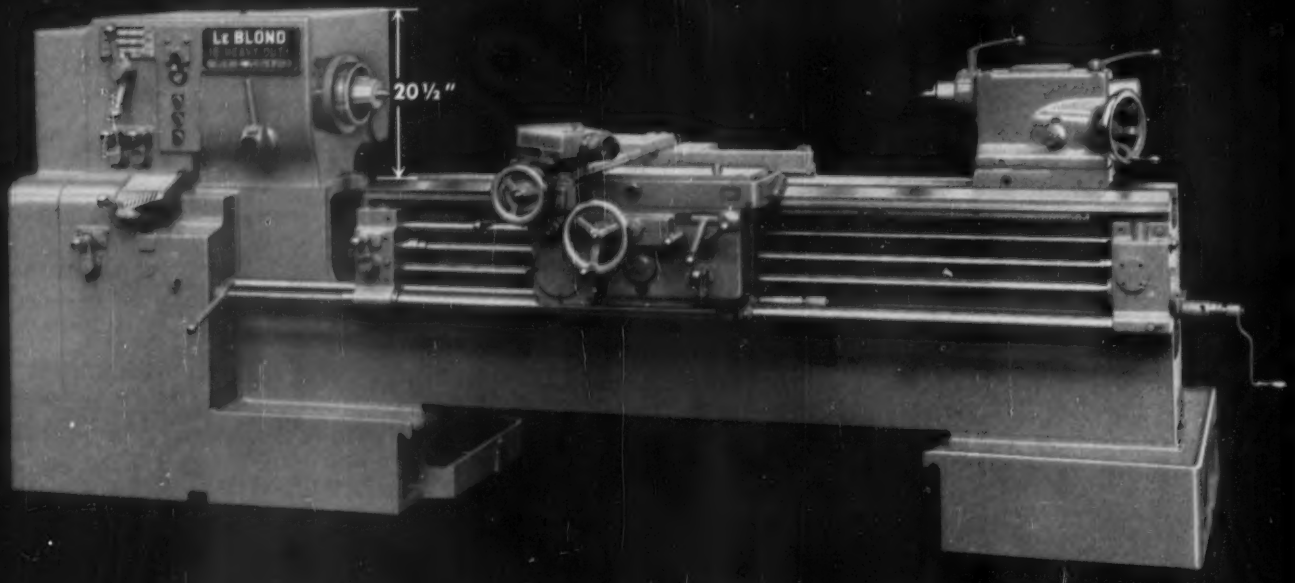
For fast, accurate results in finishing cylindrical surfaces, consult BarnesdriL engineers for recommendations and production estimates.

DETROIT OFFICE: 3419 South Telegraph Road, Dearborn, Michigan.

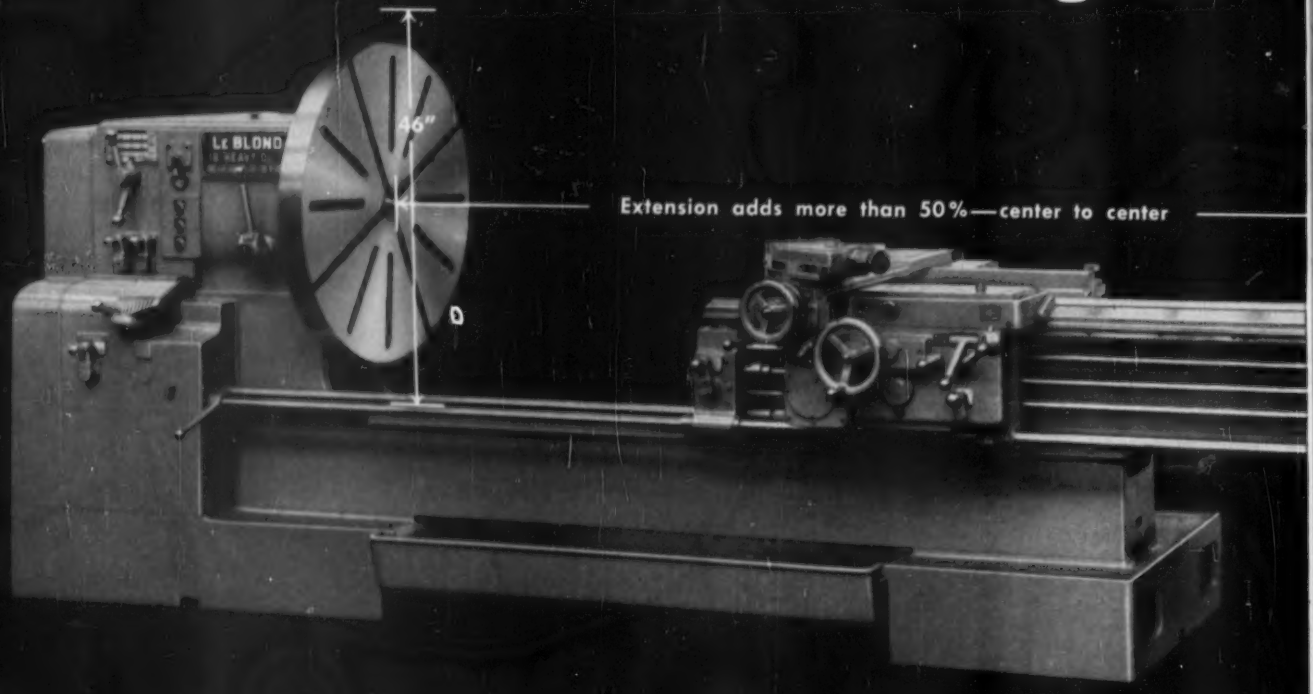
BARNES DRILL CO.

830 CHESTNUT STREET • ROCKFORD, ILLINOIS

the lathe that gives versatile a new

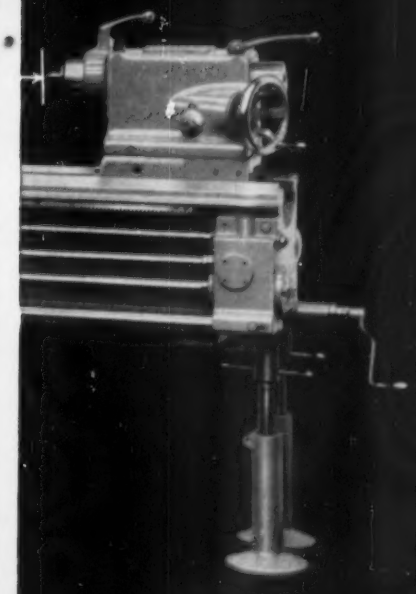


new LeBlond sliding bed



meaning!

gap lathe



Here's a lathe that is fundamentally different. It has a special bed that *slides* open to form a gap—gives you approximately *twice* the normal swing size. Sliding the bed also gives greater bed length, more than 50% greater distance between centers. And, with bed closed it functions as a regular engine lathe.

So, what we mean by a *versatile* lathe is one that actually changes shape to suit your odd-shaped parts. It handles all the usual work, plus a wide variety of large diameter jobs, extra long parts, and combinations of the two. "Swing size" as such is no longer a limitation. For example, here are some of the unusual capacities you can handle on the 16" LeBlond Sliding Bed Gap Lathe:

Face 38" diameters in one cut
Face 45" diameters in two cuts
Turn lengths more than 50% greater than normal center distance
With extension rest (optional): turn 27½" diameter, 13¼" length
With Full-Swing turning attachment (optional):
turn 45" diameter almost full length of gap

Other important features of the new LeBlond 16"/38" SBG Lathe include new spindle bearing design for high-speed turning, combination gear-belt drive headstock, 18 geared speeds, 9 timing belt-driven speeds from 8 to 2000 rpm, spur gear design, four-way rapid traverse, one-piece apron, totally enclosed quick change box, hardened and ground steel bedways, thrust-lock tailstock.

If you have a variety of parts to turn—particularly the unpredictable extremes you encounter in maintenance and job shop work—the LeBlond SBG may well be the answer. An economical answer, too! SBG's come in 4 sizes: 16"/38", 25"/50", 32"/60" Heavy Duties and the 17"/28" Regal. Like all LeBlonds they are built in every engineering detail to give you long dependable service.

Whatever your turning needs, there's a lathe in LeBlond's complete line to do the job. 76 different models to choose from. Call your LeBlond Distributor or write today.

. . . cut with confidence

LeBLOND *of Cincinnati*

THE R. K. LEBLOND MACHINE TOOL COMPANY
CINCINNATI 8, OHIO

World's largest builder of a complete line of lathes for more than 69 years

POP'S school of Filing

POP SURE TOLE MERTON OFF WHEN HE CAUGHT 'IM CHUCKIN' FILES INTO TH' TOOLBOX
POP SAYS THAT GOOD FILES DESERVE GOOD CARE, SO OUR MERTON'S BEIN' EXTRA CAREFUL NOW!

Nicholson and Black Diamond files are fine hand tools from a manufacturer who specializes in files and files alone. In steels made to exacting specifications, in blanks checked for exact conformity to a master blank, in precisely cut teeth that are given an extra-keen edge by sandblasting—in dozens of painstaking manufacturing steps and unremitting quality controls, you are assured that there are no finer files than those made by Nicholson.

An X.F. (*Extra Fine*) Swiss Pattern file is shown here. It is one of hundreds of Swiss Pattern types and sizes. In addition there are literally thousands of cuts, sizes and shapes of Regular and Special Purpose Nicholson and Black Diamond files. These fine tools needn't be treated with the exaggerated care shown by Merton in the cartoon. But they'll cut faster and last longer if you keep them clean and in a file rack. As Pop says, good files deserve good care.

NICHOLSON U.S.A.

NICHOLSON FILE COMPANY, PROVIDENCE, RHODE ISLAND

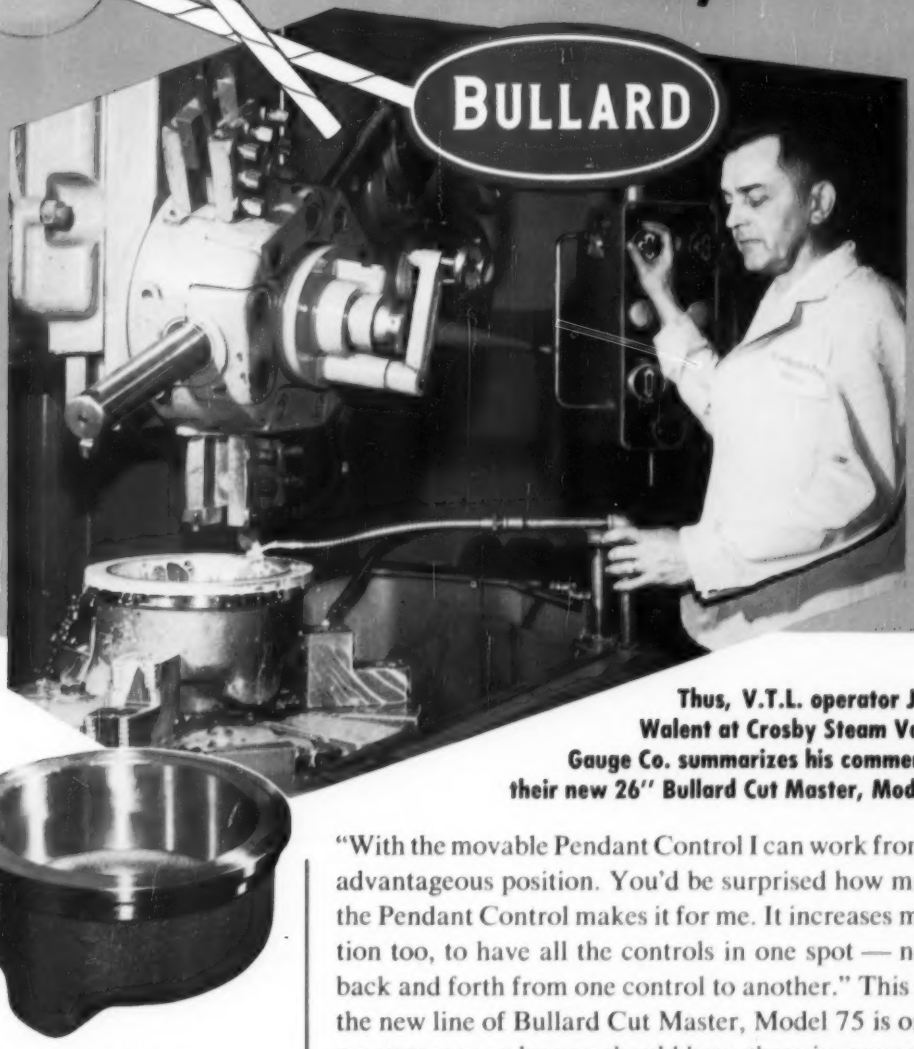
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

BLACK DIAMOND U.S.A.

NICHOLSON and BLACK DIAMOND FILES

A FILE FOR EVERY PURPOSE

"Running this CUT MASTER is as easy as taking candy from a baby"



Thus, V.T.L. operator Joseph Walent at Crosby Steam Valve & Gauge Co. summarizes his comments on their new 26" Bullard Cut Master, Model 75.

"With the movable Pendant Control I can work from the most advantageous position. You'd be surprised how much easier the Pendant Control makes it for me. It increases my production too, to have all the controls in one spot — no running back and forth from one control to another." This feature of the new line of Bullard Cut Master, Model 75 is only one of many reasons why you should have them in your plant.

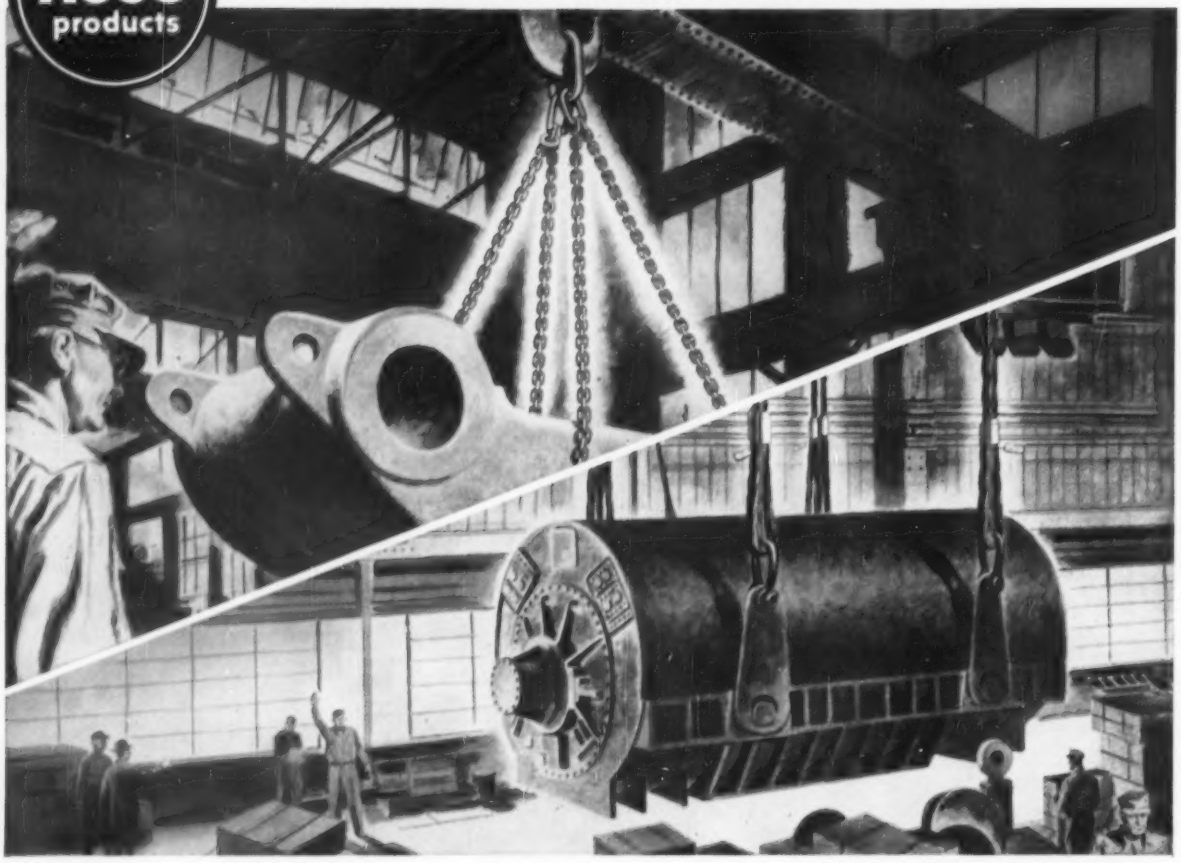
Why not get the full story — ask for a catalog by calling your nearest Bullard Sales Office, Distributor or write

THE BULLARD COMPANY
BRIDGEPORT 9, CONN.

ACCO products

Acco Registered* Slings–Wire Rope & Chain

THE STANDARD OF EFFICIENCY AND SAFETY



Why Acco *Registered* Slings are the Safest Slings Made

• Your job may demand Chain Slings, Wire Rope Slings—or a combination of both. Temperature, shape or weight of a load, protruding corners and many other factors tend to make one particular sling best for a particular application. But no matter what your requirements, ACCO has the right sling in its complete line of ACCO *Registered* Wire Rope & Chain Slings.

And with an ACCO *Registered* Sling you get the extra protection of the ACCO *Registered* program—extra safeguards which make ACCO *Registered* Slings the safest slings made.

Individually Proof-Tested • Each component of an ACCO *Registered* Sling is first tested to insure that it has strength at least equal to the sling body. All hooks for ACCO *Registered* Slings are Magnaflux tested. Then the slings are assembled according to carefully engineered designs which have proven their safety and effectiveness in extensive laboratory tests and field applications. The completed slings are then individually proof-tested at a load at least twice that for which the sling is rated.

Only after a sling has passed these rigorous tests is it registered. And this ACCO Registration is attested by a certificate and a ring or tag which are attached to the sling and accompany it to the user as his warranty of superior quality and safety.

New, Safer Master Link • Over the years ACCO has maintained a continuing research program to build more and more safety and quality into ACCO *Registered* Slings. The latest result of this research is a new and better master link for both chain and wire rope slings.

ACCO's engineers found that by shaping the master link in a particular fashion they could make it stand up under loads up to 18% greater than could standard round sections. You now get this new, stronger master link on all ACCO *Registered* Slings at no increase in price—together with the many other improvements developed by ACCO research over the years.

At Your Distributor • ACCO *Registered* Slings—Chain, Wire Rope or combination—are readily available from a distributor near you. Call him today for an extra bonus of safety in your lifting operations. If you don't know his name, write to our Bridgeport office.

*Trade Mark Registered

ACCO

AMERICAN CHAIN & CABLE

BRIDGEPORT, CONN.

Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Wilkes-Barre, Pa., York, Pa.
In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

Better Value

TEMPER, TEMPER!

If Grinding Wheel problems have you fighting mad, why horse around? Switch to CINCINNATI (PD)° WHEELS. For *now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that *can save you money . . . and increase your production.*

Through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

So, if you have grinding problems as tough as trying to tame wild horses, just contact your CINCINNATI Grinding Wheels distributor. He'll be glad to explain how (PD) WHEELS can make life serene once more. Or, contact us direct and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

Remember—*only* CINCINNATI Grinding Wheels give you . . . (PD) POSITIVE DUPLICATION.

CINCINNATI°
Grinding Wheels
A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

° Trade Mark Reg. U. S. Pat. Off.

GOLD N RING

New...

Oil-tight • Water-tight • Dust-tight

Protected against oil and water seepage by Sealtight oil-resistant rubber diaphragm. Rated for 600 volts, AC or DC. Meets requirements of Joint Industry Committee and National Machine Tool Builders' Association.

EASILY REPLACES EXISTING SWITCHES—**Designed for mounting in $1\frac{13}{64}$" diameter holes on standard panel mounting centers, this switch easily replaces existing switches. Accommodates panel thicknesses of $\frac{1}{16}$" to $\frac{1}{4}$" in $\frac{1}{32}$" increments. Full interchangeability of units and their components permits ready adaptation to multiple assemblies.**

Units are available in flush-plate or enclosed mountings, and are adaptable for special panel assemblies.

Another product of...

National Acme

Sealtight CONTROL SWITCH

Made by machine tool builders to machine tool specifications

How often have you, when designing a machine tool, wished for a control station unit designed and constructed *"as a machine tool builder would build it."*

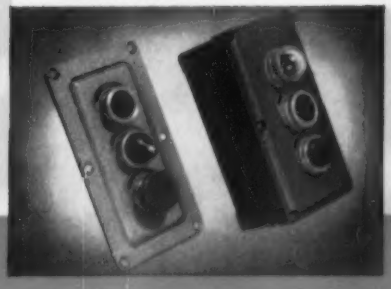
If you have been so handicapped in the past, you'll want to take a good close look at the NEW Namco GOLD-N-RING Control Station Switch Unit. Built by National Acme, builder of the world's only complete line of bar and chucking automatics, it is the *only* switch made *by* a machine tool builder *with machine tool know-how behind it.*

- **It is a heavy-duty switch in every respect.**
- **It is oil-tight, water-tight, dust-tight.**
- **Heavy-duty silver-alloy contact points provide maximum electrical capacity and long life.**
- **Heavy-duty terminal screws, with ⅜" thread contact, prevent stripping during installation and permanently secure wires for continuous trouble-free service.**
- **None easier to install; none more fool-proof.**

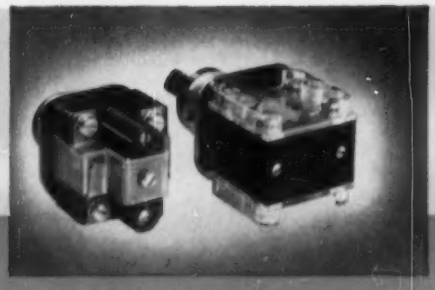
For complete details, send for Bulletin ECS-56. Better yet, ask for a representative to bring a switch for your examination.

Electrical Mfg. Division • THE NATIONAL ACME COMPANY • Cleveland 8, Ohio

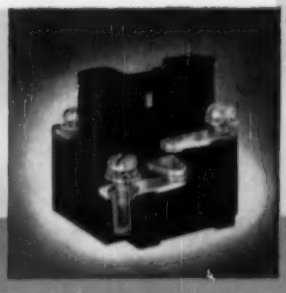
▼ **FLUSH PLATES OR ENCLOSURES** accommodate any combination of individual push button, selector or pilot light assemblies. Box covers and flush plates are provided with captive screws to facilitate installation. Easy-to-read, interchangeable legend plates lock securely into position.



▼ **SINGLE AND DOUBLE POLE CONTACT BLOCKS** can be used interchangeably with the several types of GOLD-N-RING push button and selector operator heads. Design provides easy access for secure wiring (or use of stake-on lugs) without interference. Fixed and movable contacts are completely enclosed by heavy plastic shields.



▼ **BRASS INSERTS** molded in block permanently hold stationary contacts. They also provide more thread support for the No. 8-32 terminal screws that are equipped with captive flat and lock type washers.



▼ **BUILT AS A MACHINE TOOL BUILDER WOULD BUILD IT!** Plastic shields (A) completely enclose contacts. Main block (B) is unit-molded to assure alignment and simplify assembly. Fully guided plunger (C) of cross-head design, prevents binding. Oil-resistant rubber diaphragm in operator head (D) completely seals out oil, water and dust. Easy-to-read legend plates (E) lock into position by "GOLD-N-RING" (F).

▼ **INTERCHANGEABLE "GOLD-N-RING" COLLARS** come in 3 different heights. Buttons can be made either extended or flush type merely by changing collar. Buttons are of non-fading glass-filled polyester and come in an assortment of colors to conform with standard codes.

. . . with Westinghouse Oil-Tite control stations—1 to 16 units

Interchangeable parts — stations, contact blocks, operators and indicating lights — right off the shelf, quickly give you a "tailor-made" Westinghouse Oil-Tite* control station to meet the requirements of any heavy-duty industrial equipment application.

Enclosures — die-cast and Bonderized — include cork-neoprene gasketing and close machine fits as positive seals against exposure to oil, coolants, cutting compounds, water and other foreign matter.

*Trade-Mark

New Pushbutton Guide

For more facts on why it will pay you to standardize with Westinghouse control stations, get a free copy of the new *Pushbutton Guide*, booklet B-6749. See your nearby Westinghouse salesman or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30210

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

THERE'S A WESTINGHOUSE PUSHBUTTON TO MEET EVERY APPLICATION NEED!

Where the blur of the bite means a golden display

PHOTOGRAPHED AT DETREX CORP., DETROIT, MICH.

The shower of sparks tells you right away this wheel cuts faster! But that's only *one* feature of the revolutionary new B7 Bond Resinoid Cut-Off Wheel developed by CARBORUNDUM. *Want a faster cut, free from burr and burn?* B7, tested against ordinary wheels, gives it to you...with equal wheel life. *Want up to 25% longer wheel life?* B7 gives it to you...with equal quality of finish. No wonder B7 Bond Wheels are setting new standards of performance for abrasive cut-off... in production, close tolerance accuracy, economy! Have your CARBORUNDUM Distributor or salesman put a B7 blade on your chopper type machine, and see for yourself! For Bulletin A-1374 on B7 Bond Wheels, write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Through application "know-how" and product quality

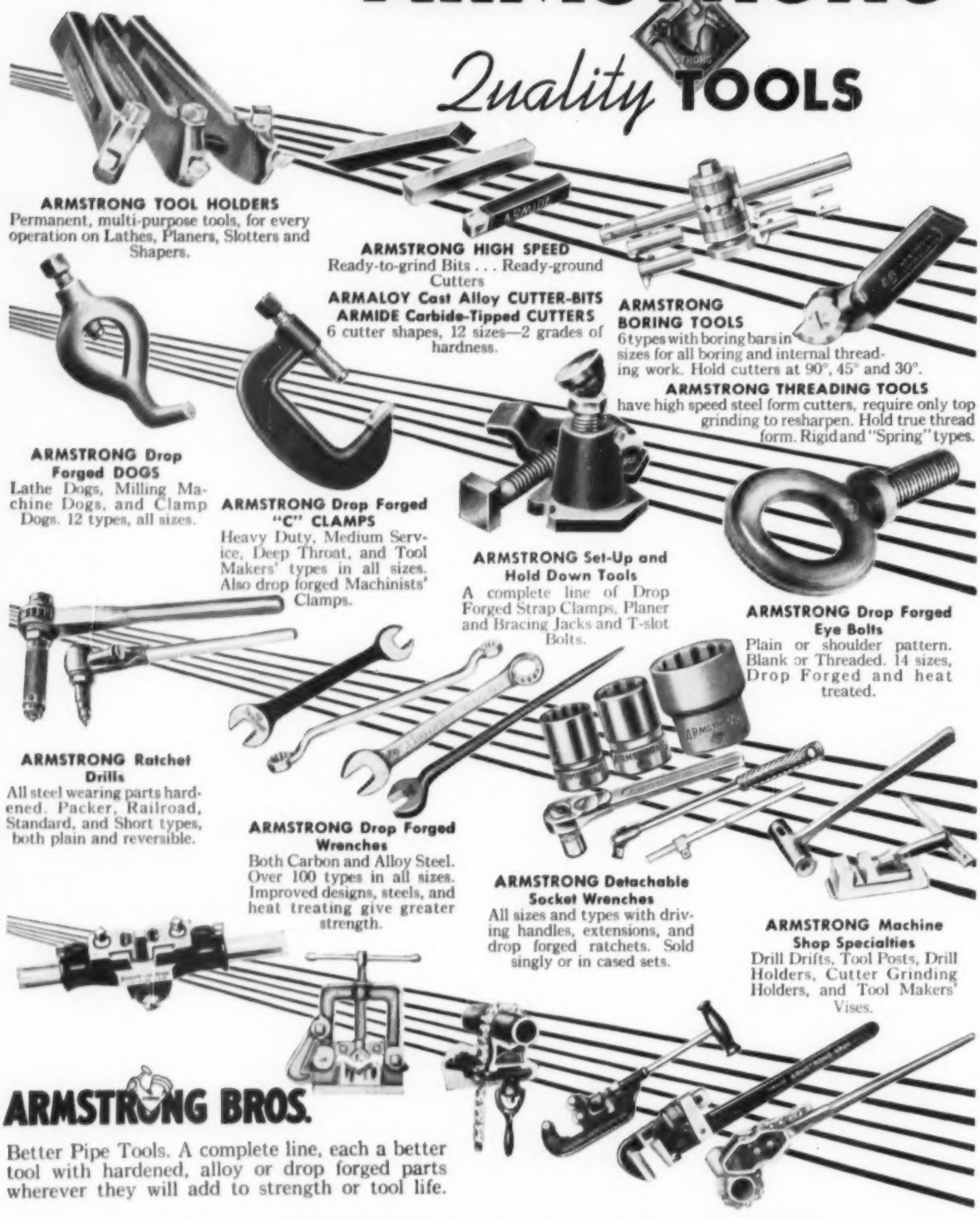
CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar

ARMSTRONG

Quality TOOLS



ARMSTRONG TOOL HOLDERS
Permanent, multi-purpose tools, for every operation on Lathes, Planers, Slotters and Shapers.

ARMSTRONG HIGH SPEED
Ready-to-grind Bits . . . Ready-ground Cutters
ARMALOY Cast Alloy CUTTER-BITS
ARMIDE Carbide-Tipped CUTTERS
6 cutter shapes, 12 sizes—2 grades of hardness.

ARMSTRONG BORING TOOLS
6 types with boring bars in sizes for all boring and internal threading work. Hold cutters at 90°, 45° and 30°.

ARMSTRONG THREADING TOOLS
have high speed steel form cutters, require only top grinding to resharpen. Hold true thread form. Rigid and "Spring" types.

ARMSTRONG Drop Forged DOGS
Lathe Dogs, Milling Machine Dogs, and Clamp Dogs. 12 types, all sizes.

ARMSTRONG Drop Forged "C" CLAMPS
Heavy Duty, Medium Service, Deep Throat, and Tool Makers' types in all sizes. Also drop forged Machinists' Clamps.

ARMSTRONG Set-Up and Hold Down Tools
A complete line of Drop Forged Strap Clamps, Planer and Bracing Jacks and T-slot Bolts.

ARMSTRONG Drop Forged Eye Bolts
Plain or shoulder pattern. Blank or Threaded. 14 sizes, Drop Forged and heat treated.

ARMSTRONG Ratchet Drills
All steel wearing parts hardened. Packer, Railroad, Standard, and Short types, both plain and reversible.

ARMSTRONG Drop Forged Wrenches
Both Carbon and Alloy Steel. Over 100 types in all sizes. Improved designs, steels, and heat treating give greater strength.

ARMSTRONG Detachable Socket Wrenches
All sizes and types with driving handles, extensions, and drop forged ratchets. Sold singly or in cased sets.

ARMSTRONG Machine Shop Specialties
Drill Drifts, Tool Posts, Drill Holders, Cutter Grinding Holders, and Tool Makers' Vises.

ARMSTRONG BROS.

Better Pipe Tools. A complete line, each a better tool with hardened, alloy or drop forged parts wherever they will add to strength or tool life.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVENUE **CHICAGO 30, ILL.**

One hour

1800 lbs.-rough

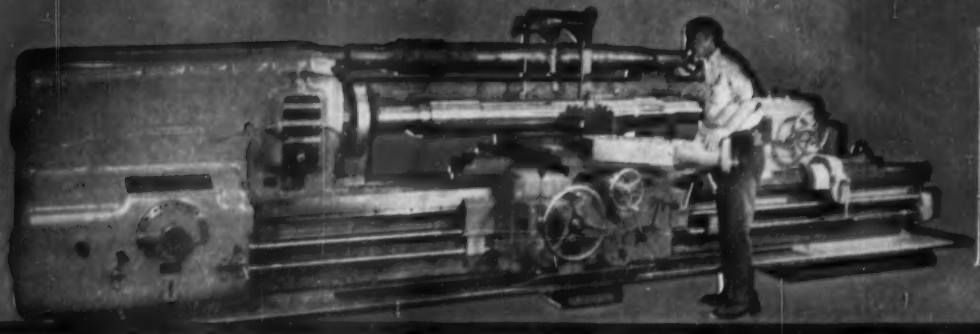
1300 lbs.-finished

One hour to finish turn this Diesel Locomotive Driving Axle from the rough forging, removing 500 pounds of chips and using 60 horse power cuts in the process.

This shows what a 25" "AMERICAN" Hydraulic Duplicating Lathe driven by a 50 H.P. motor can do. Production records of this kind are the rule rather than the exception and are being made daily.

"AMERICAN" Hydraulic Duplicating Lathes reduce machining time 50 to 75 per cent . . . cut costs to the bone . . . pay good dividends on the investment.

Repeat customers vouch for this in the most convincing way.



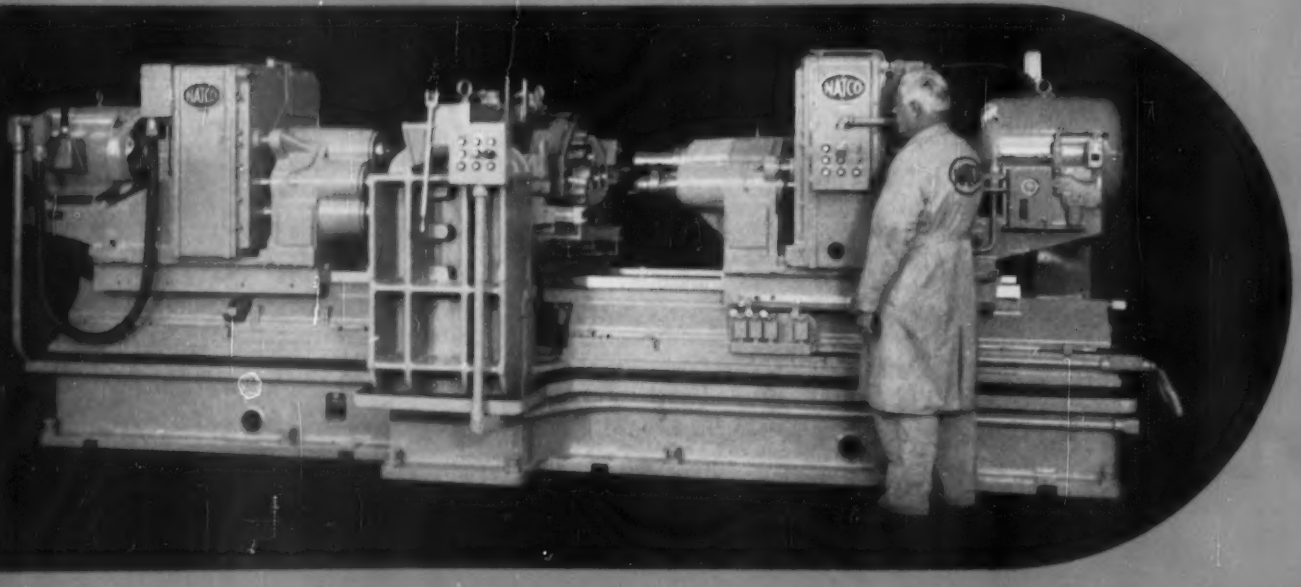
Bulletin No. 36 gives a complete description and shows many examples. It's yours for the asking.

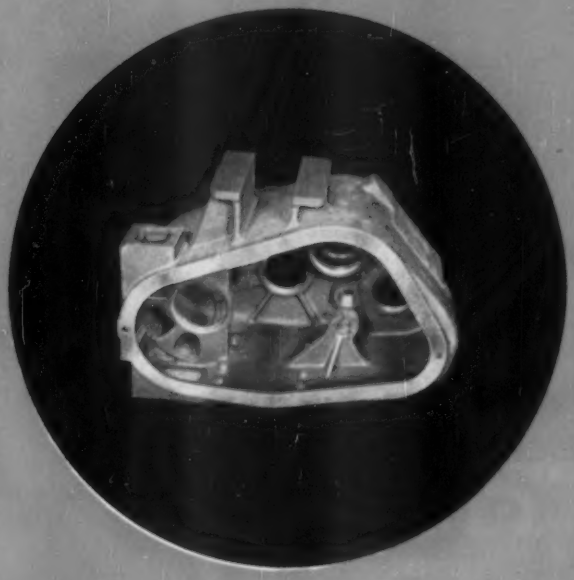
THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

Natco® Automatic Matches Boring Mill Accuracy

and quickly converts for five different jobs





This Natco two-way machine stepped in where automatics "fear to tread!" It replaced a precision boring mill, speeded production and didn't give up a tenth in accuracy! At The Frank G. Hough Co. boring mills were used for exacting tolerances on transmission parts for the Hough Payloader®. Higher production was desired.

Now with a Natco two-way automatic, Hough is getting production rates—not job shop rates. The Natco bores diameters to within .0005"—square with mounting face within .0005" per inch bore length. The machine also chamfers, counterbores and notches boss contours.

Versatile too! Hough processes five different transmission housings or covers with a single machine. After a typical production run averaging 100 parts, the machine is quickly converted to another job.

Ask for information about the PAYD (Pay-As-You-Depreciate) Finance Plan.

Currently 86% of Natco's shipments are on or ahead of schedule.

National Automatic Tool Company, Inc. *Richmond, Indiana*

Multiple-spindle drilling, boring, facing and tapping machines. Special machines for automatic production.

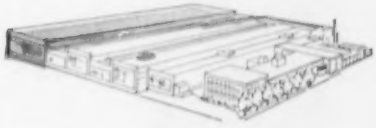
Call Natco offices in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles; distributors in other cities.

NATCO

Notes from Natco...

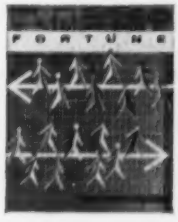
Middle Age Spread

Having reached the age of 55 feeling as spry as the day we started, we at Natco are going to spread out. The demand for our products makes this necessary since we're anxious to give our customers the kind of deliveries they need.



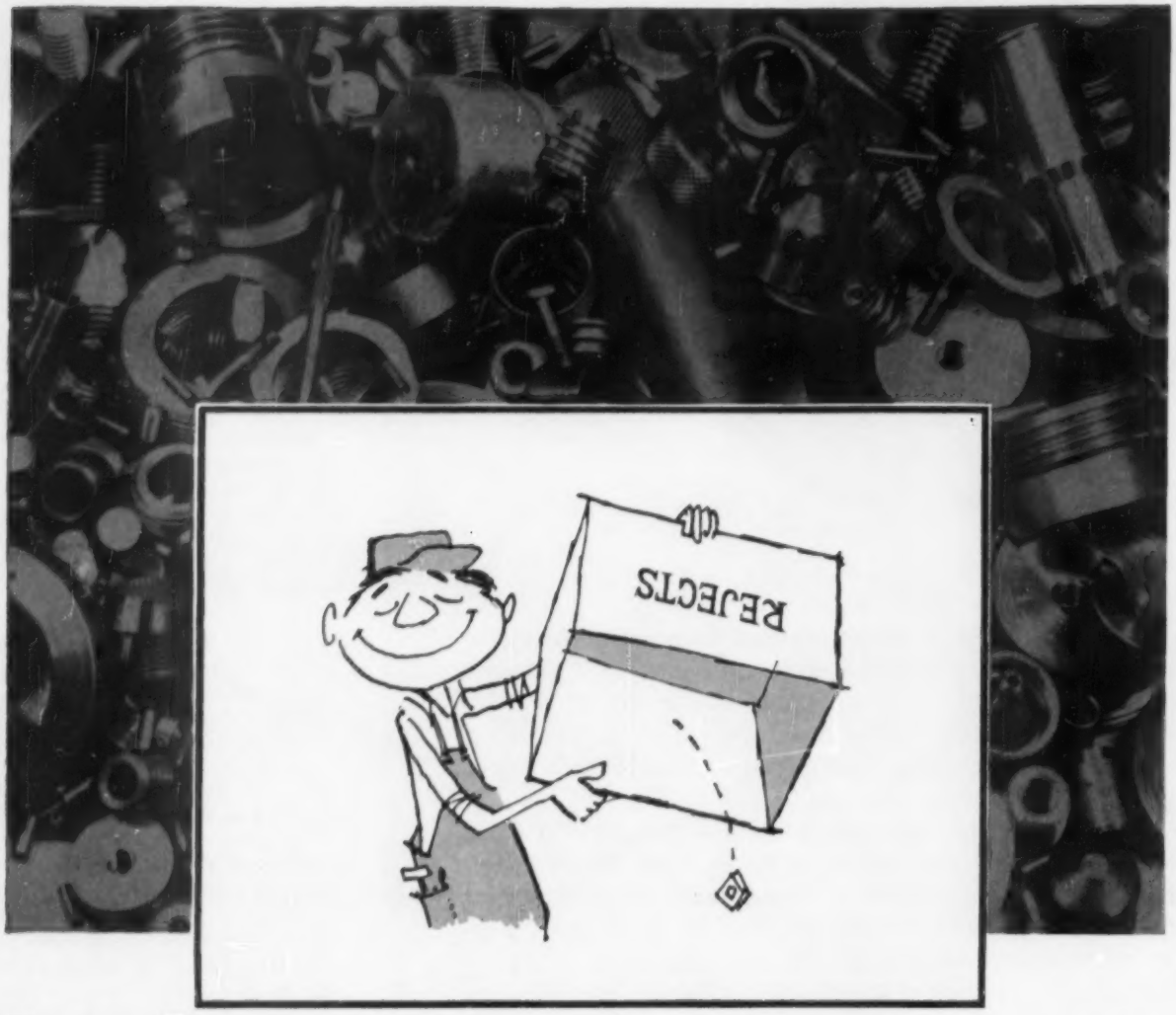
After Jan. 1, 1957, when the job is finished, we'll have eight acres under one roof at our Richmond, Indiana plant. We figure it will increase our production capacity about 50%.

To take care of the increased need for Sales Service, we've already increased our staff about 50% and provided them with new efficient quarters.



Appreciating Depreciation

Depreciation, we've come to realize, is one of the least understood and most important aspects of the business picture today. Though we're far from experts on the ins and outs of this complex subject, we've undertaken to discuss the importance of looking at depreciation realistically in our current FORTUNE campaign. We'll be happy to send you reprints if you'll drop us a line.



REJECTIONS dwindle to a new low when you start running on USS Free-Machining MX Steel.

It's a fact. Ever since this faster-cutting bar stock was developed, and in every shop where MX has been put to work, not only have more parts per hour been produced but they have been *better* parts. Better in finish, accurate in dimension, lower in cost—and with fewer rejects to cut into profits.

These highly desirable results are obtained with USS MX primarily because of its superior machinability, and also because this steel is consistently uniform in shipment after shipment. Uniform in cutting characteristics. Uniform in its composition and grain size. Uniform in freedom from defects and injurious imperfections.

Give USS MX a trial in your shop and watch production go up and costs come down. The performance of MX has been so universally superior that we feel sure that it will cut the cost of any part you now machine from ordinary screw stock.

USS Free-Machining MX is produced in both Bessemer and Open Hearth grades and is available in all the popular screw stock sizes. It is sold in cold-finished form by your regular supplier, either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our nearest district sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Bigger output... longer tool life... fewer rejects
—when you do the job with free-machining

MX

USS

UNITED STATES STEEL

BUTTERFIELD

100% inspected for
100% performance

- they cut clean
- live long
- finish smooth

Use Your Local Butterfield Distributor To Your Advantage

You get lower inventory costs, expert counsel and "hurry-up" service.

UNION TWIST DRILL CO.
BUTTERFIELD DIVISION
DERBY LINE, VERMONT, U.S.A.

dynamic

NEW

advance

in

milling

versatility...

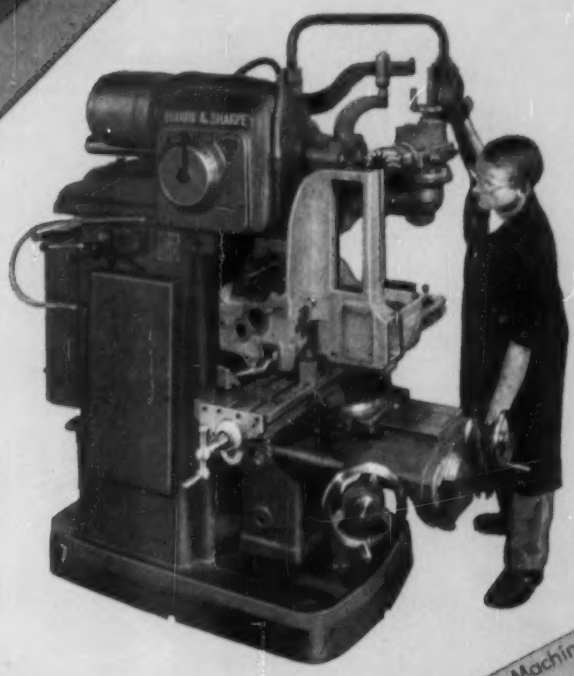
the

RANGEMASTER

Now the new Brown & Sharpe *Rangemaster* provides work-range and milling flexibility unmatched by any other single machine! Saves tremendously on set-ups — especially for multi-surface milling jobs. Permits fast, easy changes from horizontal to vertical and angular milling. Both spindles utilize full power on all work; vertical spindle has 18 speed changes from 80 to 3060 rpm. Exclusive features: Quill feed and universal head movement give 360° range in two planes without extra attachment. Both spindles on same vertical centerline. Massive ways, 22" wide, for sliding head. Sustained high-accuracy milling in any work position! Available as universal or plain milling machine. Write for full details. Brown & Sharpe Mfg. Co., Providence 1, R. I.

RANGEMASTER'S UNIQUE RANGE

28" table travel • 12" transverse feed
22⅛" sliding head movement • 20¼" vertical feed
3½" hand movement of quill in universal head



The Rangemaster (No. 20 Universal Milling Machine—sliding-head type).

Horizontal, vertical, or angular milling quickly available with full 3 h.p. at spindle.

Universal head permanently mounted on crane—swings completely out of way when not in use. Both spindles always at ideal height for fast set-up and easy operation.

Full use of table travel plus exceptional sliding head range permits milling of many multi-surface jobs with only one work set-up.

IBS

Brown & Sharpe

"Operations Kingsbury" . . . change die castings into interchangeable pump bodies

This oil pump body starts with a die casting. The piece is not machined prior to the time it enters the Kingsbury. When it leaves the Kingsbury, it's ready for assembly.

Work is required from three general directions: the mounting surface, the cover face and the top. It was decided to perform all operations in two chuckings, passing each piece through the machine twice.

The central column machine has 18 Kingsbury units — six with auxiliary heads. Twenty work-holding fixtures are mounted in pairs on an index table which indexes through ten stations — one for loading and unloading.

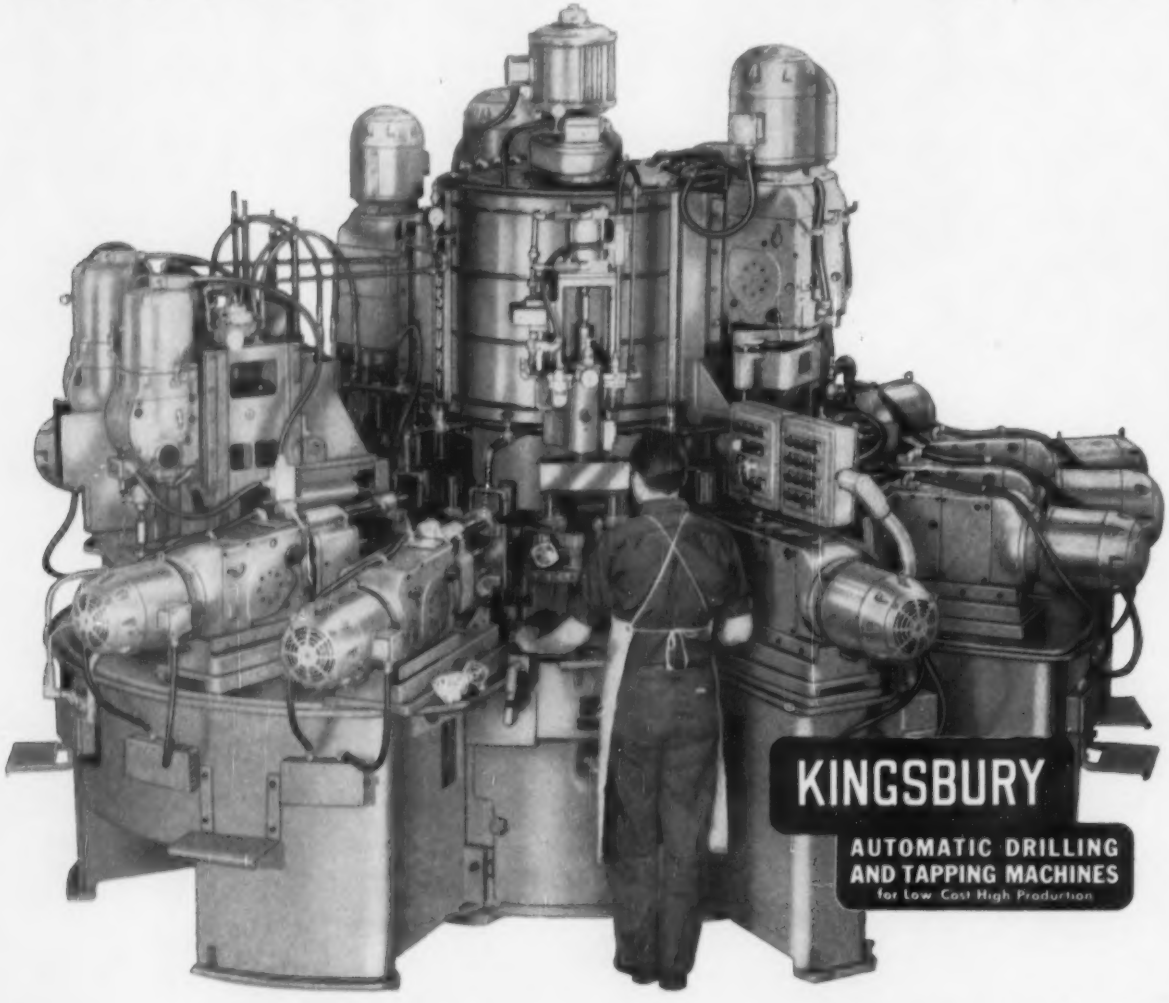
Operator places the die casting in the right-hand fixture, locating the pre-formed hole (No. 10) over a spring-actuated plug. A spring loaded ram closes the fixture, locating the piece correctly.

In the first trip through the machine, 14 spindles complete six holes and mill the mounting face. This work provides an accurate surface with precise locating points for the second chucking, in which 17 spindles complete eight holes and mill and trepan the cover face.

Result . . . each milled surface is uniformly accurate in finish and angle relationship — each hole is of proper size and is located correctly. Result again . . . interchangeability, which is what was wanted, plus rapid and economical production, of course.

An automatic machine cannot produce uniformly accurate work unless its work-holding fixtures are *designed correctly and precision-built.* You get *both* when you get a Kingsbury.

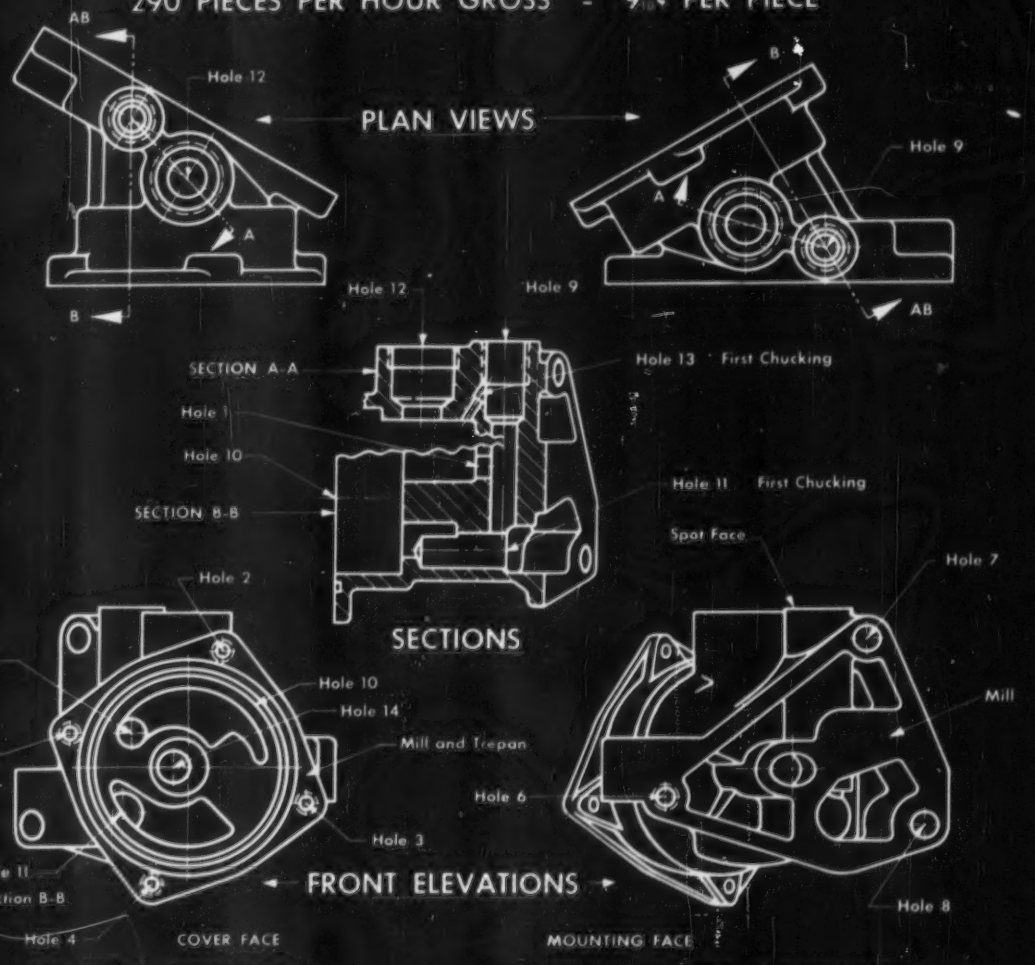
Kingsbury Machine Tool Corporation
120 Laurel Street
Keene, New Hampshire



OIL PUMP BODY - Aluminum Alloy Die Casting

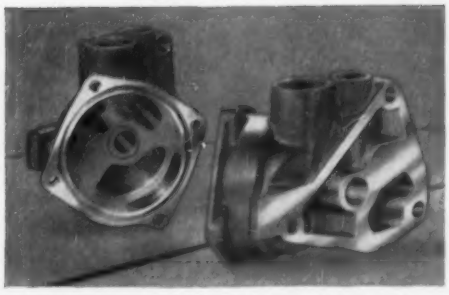
32 SPINDLE OPERATIONS FROM FOUR DIRECTIONS

290 PIECES PER HOUR GROSS - 9[illegible]¢ PER PIECE



FIRST CHUCKING		
HOLE NO	STATION	WORK
6	1-H 4-H 8-H	Tap Drill Undersize Ream Tap
7	1-H 4-H	Drill Undersize Ream
8	1-H 4-H	Drill Undersize Ream
9	4-V 5-V 8-V 9-V	Core Drill Undersize (two dias.) Spot Face Boss Ream Tap
11	6-HR	Drill to remove Flash
13	7-AR	Drill
Mount Face	2-V	Mill

SECOND CHUCKING		
HOLE NO	STATION	WORK
1	1-H	Core Drill
2	1-H 3-H	Tap Drill Tap
3	1-H 3-H	Tap Drill Tap
4	1-H 3-H	Tap Drill Tap
5	1-H 3-H	Tap Drill Tap
10	4-H 6-H 7-H	Comb. Rough Bore* Finish Bore Finish Bore
12	7-V 8-V	Ream Tap
14	8-H 9-H	Rough Ream Finish Ream
Cover Face	2-V 4-H	Mill *Comb. Trepan



Mirror photograph shows 13 of the 14 holes, and the two surfaces — completed in two chuckings.

Production turning at 1/2 the cost!

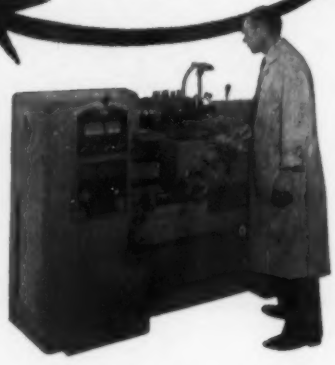
Lodge & Shipley 10" HI-TURN Production Lathe does job of really big lathe

...and completely outperforms any other 10" lathe!

BIG in power and production . . . BIG in speed, in rugged construction and accuracy, the Lodge & Shipley 10" HI-TURN Production Lathe costs only ½ the price of a good 13" lathe used for comparable work. Here are a few of the many features that put the 10" HI-TURN in the big lathe, big value class and put it 'way ahead of *any* 10" lathe:

FEATURE	Lodge & Shipley 10" HI-TURN	Lathe B	Lathe C
HEADSTOCK			
Full 5 horsepower	yes		
200 to 3000 r.p.m.	yes		
All spur gear drive	yes		
Swing over bed	13¼"		
Spindle speeds	9		
BED			
Width of bed	11⅜"		
Depth of bed	11⅝6"		
Hardened, ground, replaceable bedways	yes		
QUICK CHANGE GEAR BOX			
Number of quick change feeds	9		
Range of Feeds, thous. per rev.	1.5 to 24		
CARRIAGE			
Carriage length	19⅛"		
Carriage bridge width	5⅞"		
Cross slide travel	3½"		
Flame-Hardened and ground cross slide ways	yes		
TAILSTOCK			
Tailstock spindle diameter	2⅛"		
Tailstock spindle travel	4½"		
MISCELLANEOUS			
Size of lathe tool	¾" x ¾"		
Net weight, base machine	3400 lbs.		
Template type length stops	yes		

You make the comparison *with any 10" lathe*



Compare the Lodge & Shipley 10" HI-TURN Production Lathe with *any other* 10" lathe . . . even with 13" lathes. If you don't need additional thread chasing facilities, it's the lathe for you!

Get complete details now. Write: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

Your Lodge-ical Choice for low-cost high-production

Lodge & Shipley

Carbide tipped slab broaches.

Partial view of a conventional round hole broach. Roughing, semi-finishing and finishing teeth are shown.

This solid carbide finishing shell fits on an arbor of a conventional round broach.

Surface broach with adjustable and replaceable carbide tipped tool bits.

Here's Why Continental Quality Broaches Actually Cost Less Than Ordinary Broaches

Continental's experience in designing and manufacturing has broadened the use of broaching and has brought its advantages to applications that were normally considered impractical.

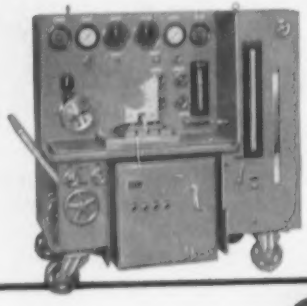
Continental engineers are tool specialists. Every tooth of a Continental broach is an effective cutting tool because of quality materials, skilled craftsmen and engineering experience.

Continental broaches are free cutting, hold required tolerances and finishes with maximum pieces per tool. That's why many manufacturers have learned to agree with Continental—*the best broaches cost less.*

Continental
TOOL WORKS
Division of
Ex-Cell-O Corporation
Detroit 32, Michigan

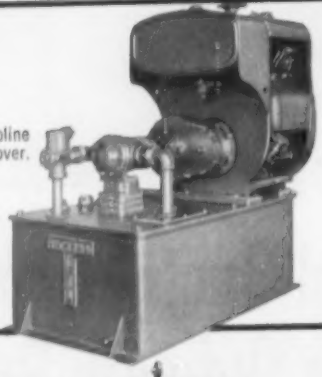
Pulpit type power unit provides full visibility, easy accessibility.

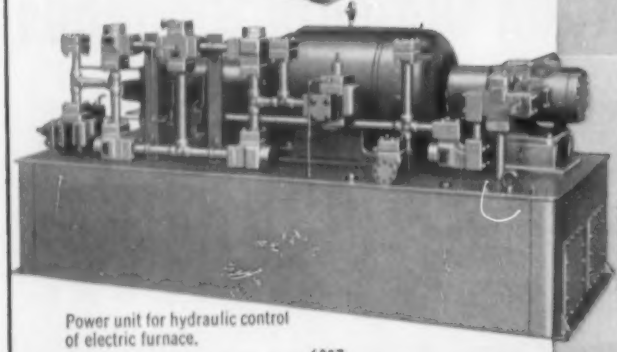
Compact power unit showing gasket-mounted valves.



Portable power unit for testing pumps.

Power unit with gasoline engine as prime mover.





Power unit for hydraulic control of electric furnace.

6837

Individually Designed to Meet *SPECIFIC* Needs

VICKERS®

Custom Built

HYDRAULIC POWER UNITS

DEPENDABLE PERFORMANCE

IMPROVE AND SIMPLIFY DESIGN

REDUCE INSTALLATION COST AND TIME

EASIER SERVICING

BETTER APPEARANCE

Vickers engineers approach the design of a custom-built hydraulic power unit from the standpoint of the customer's INDIVIDUAL needs. The sole objective is to meet HIS requirements with the best hydraulic "package". This assures the most compact, efficient and convenient hydraulic equipment for the particular machine.

A Vickers Hydraulic Power Unit includes all necessary pumps, valves, intermediate piping, oil reservoir, motors, controls, etc., as well as all hydraulic accessories (oil filters, air cleaners, oil level gauges, fittings, etc.). Hydraulic connections can be grouped in a convenient manifold.

In addition to the advantages mentioned above, each Unit is pretested at the factory and ready for immediate operation. Vickers undivided responsibility for the entire hydraulic control system is also an important feature to both the machine builder and his customer. Write for Bulletin 52-45.

VICKERS INCORPORATED

DIVISION OF SPERRY RAND CORPORATION

ADMINISTRATIVE and ENGINEERING CENTER

Department 1410 • Detroit 32, Michigan

Application Engineering Offices: **• ATLANTA • CHICAGO AREA (Brookfield) • CINCINNATI • CLEVELAND • DETROIT • HOUSTON LOS ANGELES AREA (El Segundo) • MINNEAPOLIS • NEW YORK AREA (Summit, N.J.) • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE. • ROCHESTER • ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS • TULSA WASHINGTON • WORCESTER**

IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Here is the FASTEST KNOWN METHOD

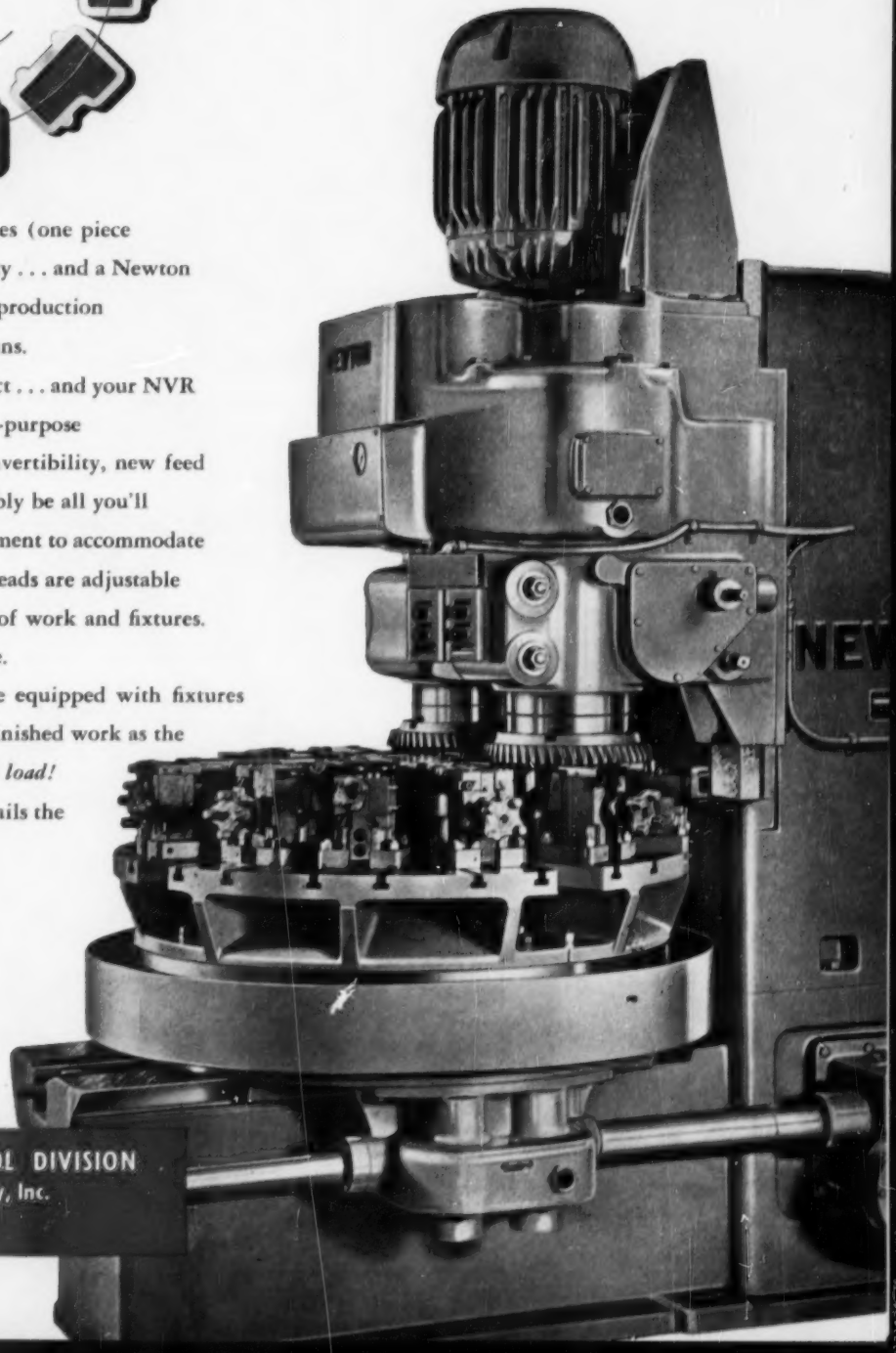
of milling the flat surfaces of repetitive pieces

Mount your fixtures on base plates (one piece or sectional) for quick changeability . . . and a Newton Vertical Rotary will give you mass production economy on comparatively short runs.

Change the design of your product . . . and your NVR won't land in the morgue of single-purpose machine tools. Thanks to high convertibility, new feed and speed pick-off gears will probably be all you'll need. Tables have in-and-out adjustment to accommodate cut-circles of different diameters. Heads are adjustable up and down for different heights of work and fixtures. Spindles are individually adjustable.

Newton Vertical Rotaries can be equipped with fixtures that clamp, unclamp and eject the finished work as the table turns. *All the operator does is load!*

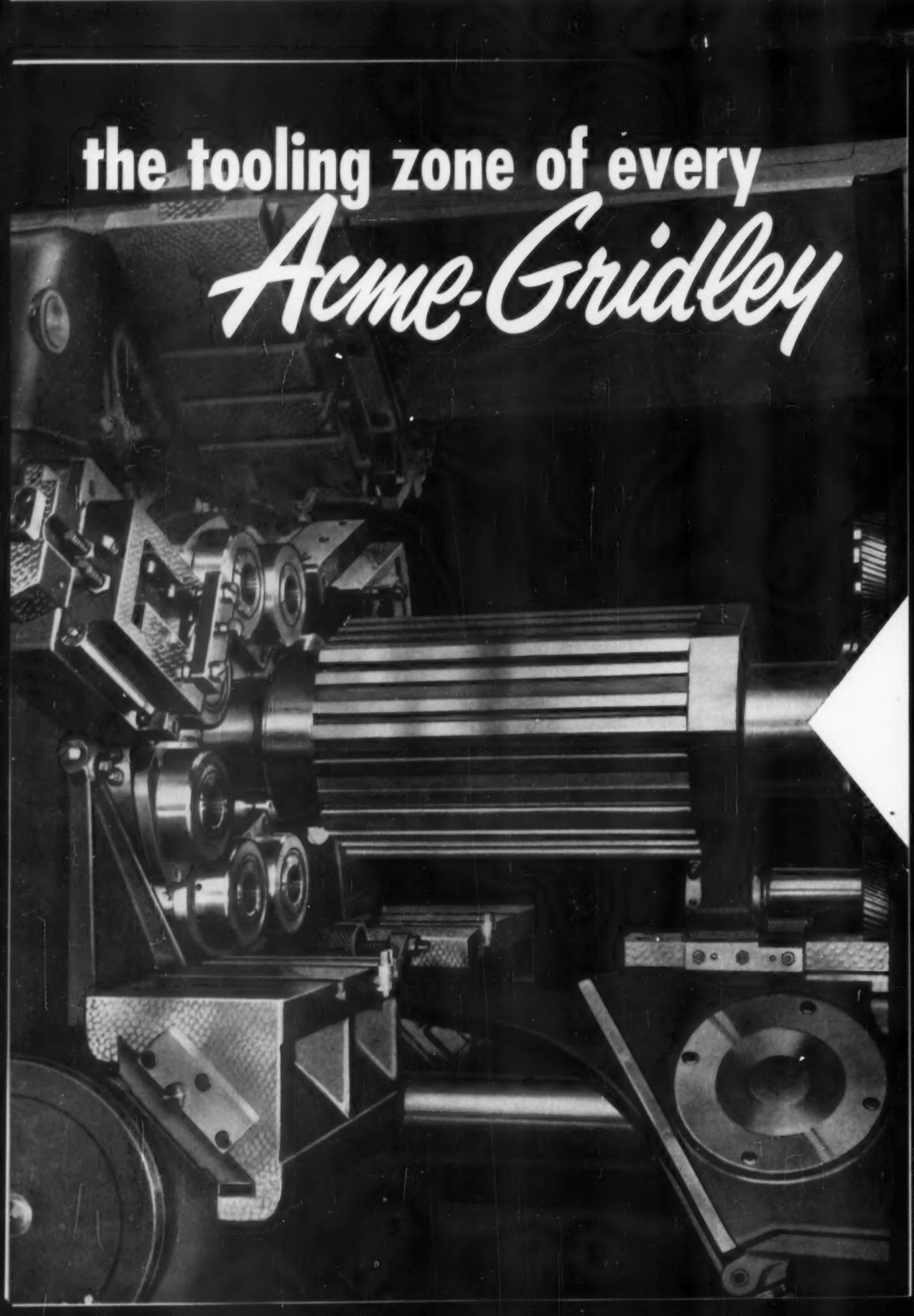
Write for bulletin 651, which details the advantages of these machines.



F/B

CONSOLIDATED MACHINE TOOL DIVISION
Farrel-Birmingham Company, Inc.
ROCHESTER 10, N. Y.

CM-4

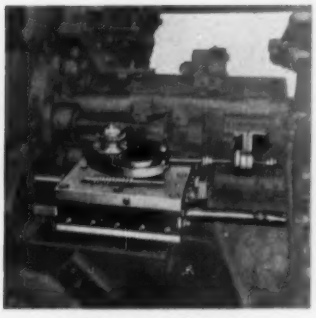

the tooling zone of every
Acme-Gridley

—open . . . *for business!*

Since the primary advantage of a multiple-spindle automatic is to make it possible to complete more operations in a single setup, accessibility *to* and plenty of space *in* the tooling zone, *to apply the maximum number of tools*, is especially significant.

When you want to speed up production, perform unusual operations, or to get a finer finish, let a National Acme tooling engineer apply his COMPLETE LINE experience in helping you select the attachments to perform these operations on your machine.

Combination Cross Milling and Drilling Attachment



Worm or Thread Generating Device

Threading or Tapping Tool

LET US TELL YOU MORE ABOUT *Acme-Gridley* BASIC DESIGN

This is but one of many BASIC DESIGN features which are responsible for Acme-Gridley's outstanding performance records. May we send you additional information? Or, better yet, let us send a representative to discuss possible production short cuts with you.

National Acme

THE NATIONAL ACME COMPANY, 171 EAST 131ST STREET, CLEVELAND 8, OHIO

SALES OFFICES: • Newark, N. J. • Chicago, Ill. • Detroit, Mich.

high scorer

. . . and in high speed steels, it's always REX

Crucible's REX® high speed steel always scores highest on performance—as it has for more than a half century. That's because it is consistently sound and uniform in structure . . . with dependable response to heat treatment.

But don't take our word for it. Check REX for yourself—by any test you choose. You'll discover that recent improvements in manufacturing techniques have made it better than ever—why REX is today, as it's always been, *the standard by which all other high speed steels are compared!*

REX is immediately available at all Crucible warehouses, or on prompt mill delivery. For a list of helpful data on REX and other *special steels*, write for a free copy of the "Crucible Publication Catalog." *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

MATTISON
HIGH-POWERED
PRECISION

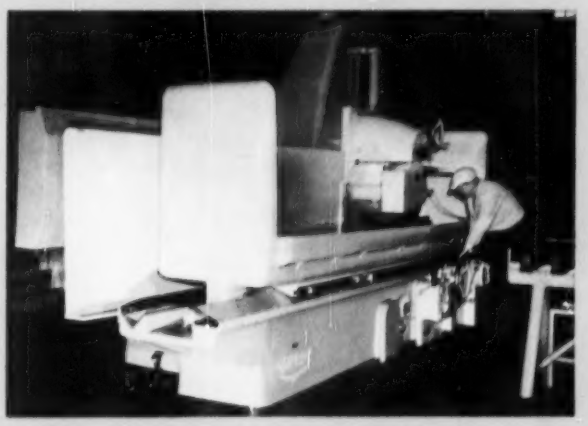
IF IT'S A FLAT SURFACE
THERE'S A MATTISON
TO GRIND IT!

GRINDING METHODS

For high-precision, high-production, or both... grind it on the Mattison! Here is an example of how Mattison Horizontal Spindle Surface Grinders are used wherever close tolerances are needed—in both high-production and general-purpose machining.

Above, WARPLIS precision ground flat stock is ground at a high rate of production to a standard thickness tolerance of plus or minus .001 in., with many special runs requiring a total tolerance of .0005 in. Precision tolerances are easily held on a Mattison —a machine that is built to handle small or large parts, with stock removal rates you never thought possible on a surface grinder.

The machine at the right is used for general-purpose machining in a large railroad shop. No costly fixtures are needed to accommodate the wide variety of work required. Stock is "hogged off" at surprising speed, with virtually no setup time between jobs. This versatility is the reason many manufacturers are switching from lighter machines and other machining methods to high-powered surface grinding.



• Mattison grinders are used to machine inside and outside surfaces of multiple guards for steam locomotives, as well as for grinding guide bars and miscellaneous parts for diesel motors, shear blades, and hardened steel dies.

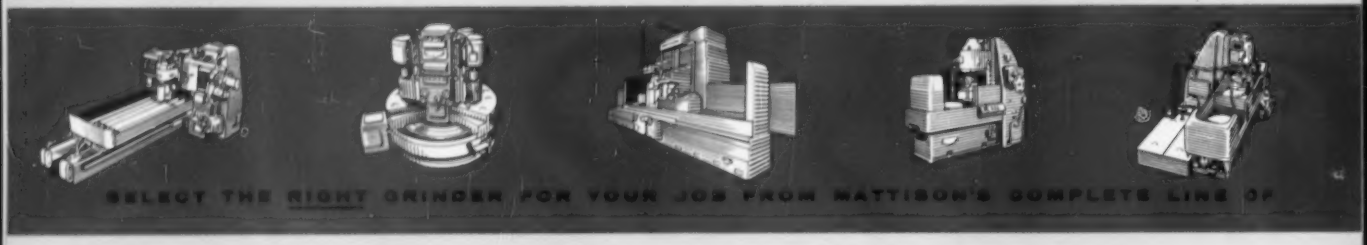
SWITCH FROM PLANER TO MATTISON FACE GRINDER BOOSTS PRODUCTION OF BRAKE BASES 200 TO 300 PER CENT

Accuracy and finish upgraded on the Mattison "UK"

• Large cast steel brake bases, formerly machined on a planer, are finished three to four times as fast and more efficiently on this Mattison "UK" Traveling Wheel Face Grinder.

Surface finish has been improved considerably, and it is now easier to machine the brake bases to desired limits of accuracy. The machine is so simple to operate and easy to set up, operator skill requirements have been reduced on this job with resultant savings in direct costs.

At this plant, many jobs formerly done on a planer or milling machine are now being machined faster and more efficiently on the Mattison "UK". The large traveling wheel—feeding at the end of each stroke—covers the entire work surface on each pass. All cuts are finishing cuts, whereas first operations on the planer or milling machine had to be roughing cuts. As a result, it is now easier to machine the parts to specified tolerances.



• Mr. Schaffer, A. M. Castle Grinding Service, can use his Mattison "No. 36" continuously because the wheelhead is so easy to adjust. The machine can cut a convex or concave surface, and then be reset in a matter of minutes to grind flat and parallel work.

"Our Mattison cut manhours in half . . . paid for itself in only a few months!"

• "With this machine, we can beat any comparable piece of equipment for metal removal," reports A. M. Castle Grinding Service, Los Angeles.

"Its ruggedness, ease of operation, and efficiency save us time and money. The machine cut our manhours just about in half, and paid for itself in a matter of a few months."

This machine is used for subcontract grinding, which requires fast stock removal, easy adjustment, high precision, and wide work range. These demands are easily met, because Mattison's extra-heavy and rigid construction permits the use of high horsepower (in this case, a 50 hp spindle motor). This extra power produces high unit pressures for grinding large surfaces, and assures positive free-cutting action.

Investigate the new features Mattison has added to its line of rotary surface grinders, including the new, heavier Meehanite base, new continuous down feed, improved protection for column ways, and two optional automatic sizing and cycling systems.

MATTISON
HIGH-POWERED PRECISION
GRINDING METHODS

Traveling wheel design accommodates over-length parts!

• The entire length of extra-long or heavy parts can be ground quickly to close tolerances on a Mattison "UK" Traveling Wheel Face Grinder that occupies little more than *half* the floor space required for traveling table machines of equal capacity. One end of the work is supported by the stationary work table, the other end by supplemental blocking. Mounted on a slide with long, wide ways, the grinding wheel head can be fed by hand or automatically in steps of .0005 in. to .003 in. The carriage bears it across the entire work surface each trip. The operator's position on the carriage, together with the convenient grouping of controls, permits fast, accurate production regardless of the size of the part. If you want to machine the ends of long castings, structural steel beams, rails, steel plates, and similar large parts, the Mattison Type "UK" Traveling Wheel Face Grinder will be a profitable investment for you. Write for complete facts in Bulletin 844-2.

50 DIFFERENT MACHINES • SURFACE GRINDERS • FACE GRINDERS • DISC GRINDERS

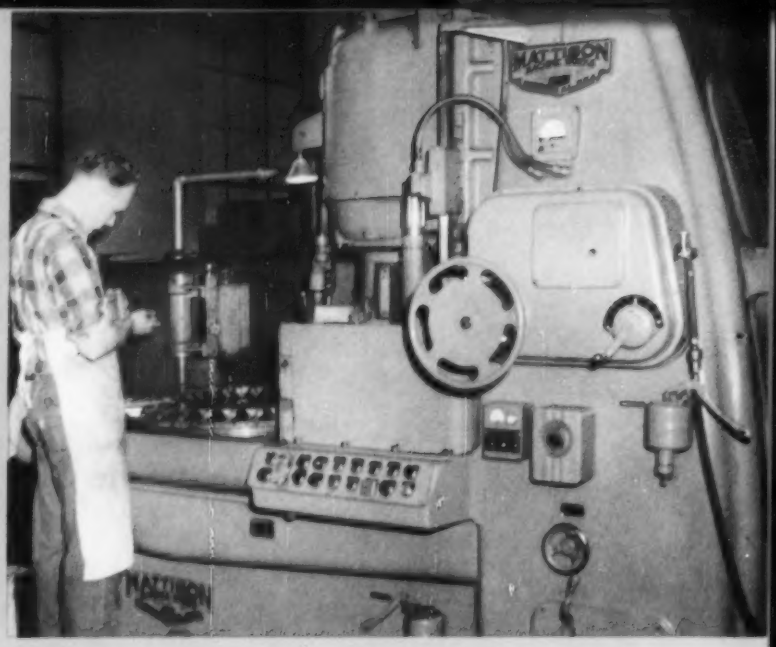
Holds 4 ends square, parallel, and to size, at high-production rate!

• Precision, low-cost production of Universal Joint Spiders was made possible by this Mattison Model 221 Double Disc Grinder. Operation calls for grinding four ends of spiders measuring 7¾ in. over ground surfaces, at a high rate of production and with stock removal of .010 in. Opposite ends of these parts must be ground square with the trunnion diameter and parallel to each other. They are held in "V" fixtures with swiveling "U" blocks and fed through the Mattison on a rotary drum-type feed mechanism, which is manually loaded and unloaded. Automatic work sizer feeds the grinding wheel heads independently, compensating for wheel wear. Automatic feed increments can be as small as .0001 in.

Mattison Disc Grinders offer a low-cost method for machining opposed surfaces and thin-walled parts to extremely close tolerances. Three types of feed are available, including oscillating feeds, hand or power operated; rotary fixtures (like the one illustrated); and straight through feed for highest production jobs.

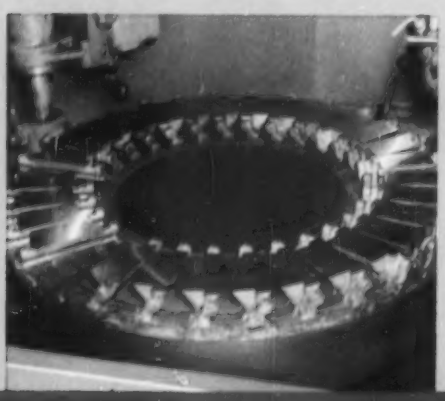
• Universal Joint Spiders (No. 8620 steel) are ground on four ends, holding size within .001 in. Mattison builds these high-production disc grinders in five sizes, ranging from 10 to 30 in. disc wheel capacity, with 1½ to 50 hp spindle motors.

CHANGE TO SURFACE GRINDING—CUTS COST PER FINISHED PIECE FROM 31¢ TO ONLY 9¢!

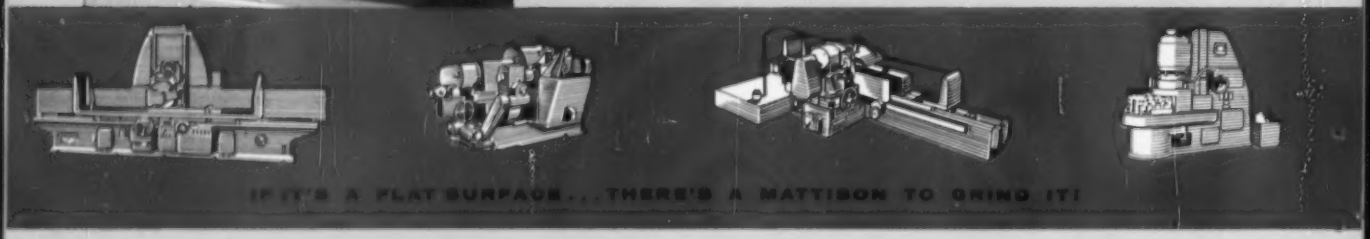


• These chain links formerly were milled at the rate of 100 every three hours, using high-speed steel cutters. Eighteen pieces were produced between sharpenings. At 35 minutes per sharpening, 3.2 hours of cutter maintenance were required for every three hours of production, with a labor cost of $16. This, plus a machining cost of 15¢ per piece, resulted in a total cost of 31¢ per piece to mill.

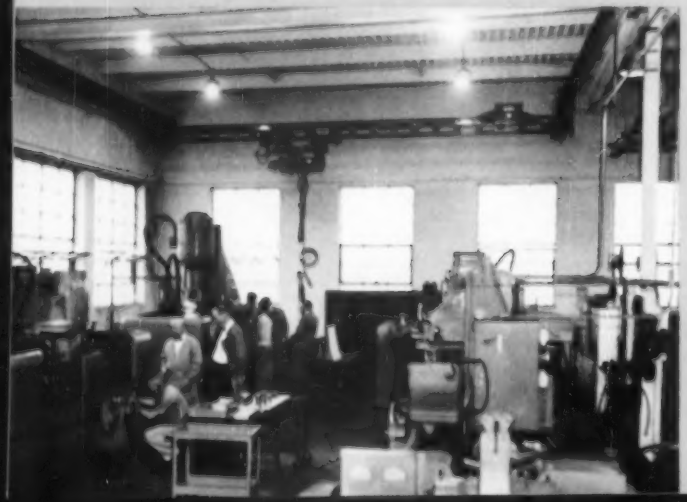
Today, links are ground at the rate of 100 pieces per hour on the Mattison No. 24 Automatic Cycling Vertical Spindle Surface Grinder. Powered by a 40 hp spindle motor, the machine removes .140 in. of stock at .016 in. minimum down feed per minute. Wheel cost is only 4¢ per piece, and cutter maintenance is eliminated (wheel is self-dressing). With a labor and machine cost of 5¢ per piece, total cost to grind is only 9¢—a saving of more than 22¢ per piece . . . plus additional savings in cost of milling cutters.



Left, 30 of these 4140 drop-forged chain links are ground in one operation. The automatic sizer gauges the parts continuously and stops the automatic cycle when finish size is reached. Mattison's new *continuous down feed* makes it easy to hold close limits. And, there is no restriction on the feed rate because of linkage actuation. If you are machining large or small flat surfaces in long or short production runs, and you want to reduce cutting tool and material costs, eliminate rejects, or simplify setup and handling of work, why not let Mattison grind your parts and demonstrate improvements made possible by high-powered surface grinding!



SEND US YOUR PARTS FOR FREE DEMONSTRATION GRIND!



• The Mattison Methods Laboratory, equipped with all major types of modern surface grinders, face grinders, and disc grinders, introduces a new service to metalworking plants. You are invited to submit parts for sample grinds and production estimates. Please include part prints, operation or route sheets, and all special requirements for machining your pieceparts. You'll get a comprehensive and reliable report based on close duplication of field conditions.

MATTISON MACHINE WORKS

HIGH-POWERED PRECISION SURFACE GRINDERS

MATTISON MACHINE WORKS

ROCKFORD, ILLINOIS

Grand Prize
ARMAND MONARD
9404 211 Street
Queens Village 28, N.Y.

HERE ARE THE WINNERS IN JONES & LAMSON'S NEW HORIZONS CONTEST

2 Second Prizes

ANDY TOROK
19322 Santa Clara
Detroit 19, Michigan

W. H. BRAUN, JR.
11048 Blix Street
N. Hollywood, California

3 Third Prizes

CHARLES LEO SADON
24 Endicott Street
Saugus, Massachusetts

JOSEPH C. BARRETTE
24 Rosedale Street
No. Providence 11, Rhode Island

LEON HAROLD RICE
RFD #2, Church Road
Bedford, New Hampshire

10 Fourth Prizes

Edward M. Alexander
RR 1, Box 234
Mooresville, Indiana

C. L. Robinson
1826 Chippendale Street
Houston, Texas

Daniel J. Ruggiero
Main Street, Box 7
Jonesville, New York

George G. Perla
2331 Colonial Avenue, S.W.
Roanoke, Virginia

Thomas M. Jackman
31909 Saginaw Court
Wayne, Michigan

Louis Marcolivio
260 Webster Avenue
Providence, Rhode Island

Euclid U. Lebert
408 Hillside Drive
Anderson, South Carolina

Bruce J. DeNeve
79 Varian Lane
Rochester, New York

Edward Gagne
30730 Horse Island Drive
Gibraltar, Michigan

Frank S. Wozniak
2331 Harrison Street
Schenectady 6, New York

J&L heartily congratulates the winners of the Jones & Lamson NEW HORIZONS CONTEST. As winner of the Grand Prize, Mr. Monard, who is Methods Engineer with Control Instrument Co., Brooklyn, N. Y., receives a Two-Weeks Luxury Vacation Trip for Two, All Expenses Paid, to his choice of one of the following: Paris, Hawaii, The Caribbean, The Canadian Rockies, Plus $400 for spending money, baby sitter fee, etc.

Mr. Torok (Supervisor, Production Process & Design Section, General Products Division, Ford Motor Company, Dearborn, Michigan) and Mr. Braun (Process Engineer, Hughes Aircraft Co., El Segundo, California) as Second Prize winners each receive a Seven-Day All-Expenses-Paid Luxury Vacation for Two to Bermuda, Plus $200 spending money.

The three winners of Third Prizes each receive a Shopmaster Combination Saw-Jointer Power Tool, complete with motor.

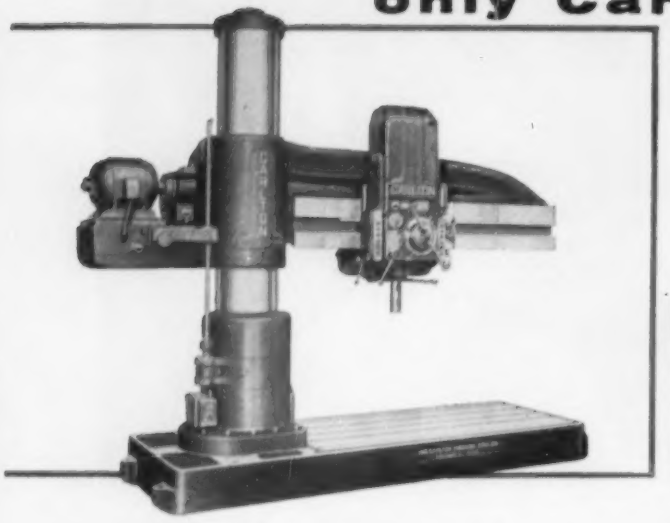
The ten winners of Fourth Prizes each receive a Shopmaster Individual Single-Purpose Power Tool (a choice of Saw, Drill Press, Jointer, etc.)

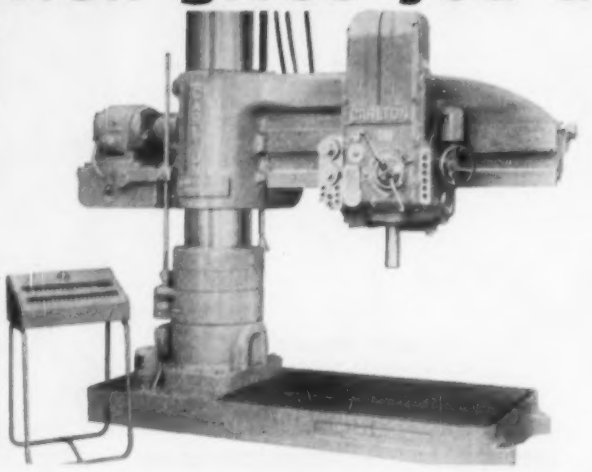
The Board of Judges, in announcing its decision, remarked that the general excellence of the many entries received made the judging process a most difficult one.

To all those who expressed interest in this contest, we extend our sincere appreciation and thanks.

JONES & LAMSON MACHINE COMPANY
502 CLINTON STREET, SPRINGFIELD, VERMONT

only Carlton gives you a





1. Programming and pre-selector gear shift sets up correct speeds and feeds for a complete sequence of operations.

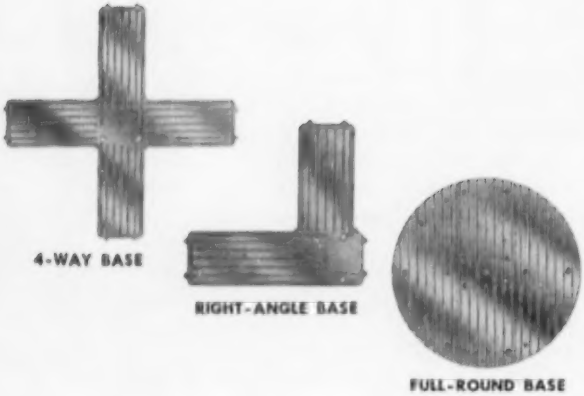
With the introduction of the new Carlton-Leber speed-feed programming and pre-selector systems, you can now take your choice of three speed-feed controls: programming, pre-selector or manual.

Programming works like this: your production engineering department studies the workpiece drawing and determines the sequence of drilling operations and the correct speed and feed for each. This data is recorded on a routing sheet or blueprint and is transferred to the programming console.

The programming console contains an indexing dial which shows the operation sequence number being performed. Operator has local control and can perform operations out of sequence by manually advancing or reversing the indexing dial.

Pre-selector: For less lengthy or complicated drilling jobs, the programming unit can be disconnected through a selector switch and the pre-selector then becomes operative. The pre-selector saves time by allowing operator to select speed and feed for the next operation while the machine is under cut. Pre-selector may be furnished with or without the programming unit.

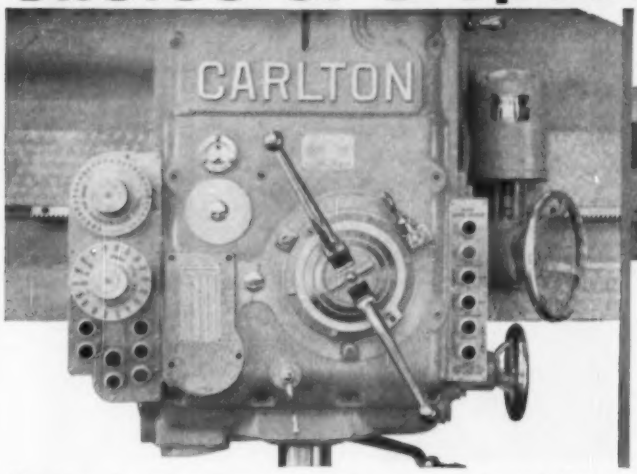
and special bases, tables and



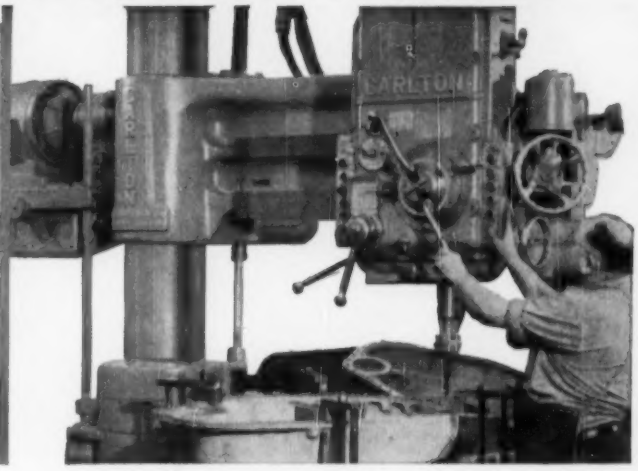
Special bases: Carlton radial drills can be furnished with any of seven different types of stationary bases (three of which are shown above). In addition, special track type mounting and sliding bed plate base also available.

Special tables: Plain, uni-tilt and full universal tables available as extra equipment. The universal table shown above is Carlton engineered and built, is fully universal and has a 32″ round top.

choice of 3 speed-feed controls



2. Pre-select gear shift: 1 speed graduated dial and 1 feed graduated dial pre-set speeds and feeds.



3. Manual gear shift: 2 shifter levers for controlling speeds, 2 shifter levers for controlling feeds.

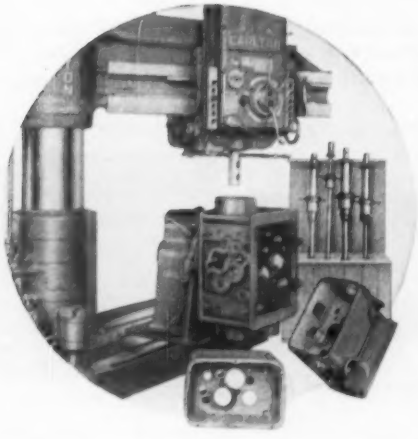
Manual gear shift: Selects speed-feed combinations in the conventional manner—manually, one at a time, using two speed shifter levers and two feed shifter levers.

Carlton gives you a wide choice in radial drill selection . . . not only in speed-feed control systems, but also in size and capacity. You're sure to find your most economical drill size at Carlton, because the broad Carlton line includes arm lengths from 3-ft. to 12-ft., column diameters from 9″ to 26″. For the complete range of sizes, send for descriptive literature.

Carlton also gives you the advantage of a wide selection of special bases, tables and jigs and fixtures (see below). A capable sales-engineering staff will study your requirements and submit without obligation a recommended tooling set-up that's best for you.

Carlton has just published a new 24-page booklet presenting the most modern concept on how you can get better, more efficient, lower cost drilling. Why not write for your free copy today? The Carlton Machine Tool Co., Cincinnati 25, Ohio.

jigs for additional productivity



Special jigs: Carlton engineers will be glad to recommend the most efficient tooling for your requirements. The set-up shown above reduced running and set-up time from 7 hours down to 5.25 hours. Includes master trunnion, jigs and boring bars.

Carlton

horizontal and radial drills

precision reaming **CUTS HOLE FINISHING COSTS**

BARBER-COLMAN offers

Close control of size and finish

Consistent duplication of accuracy

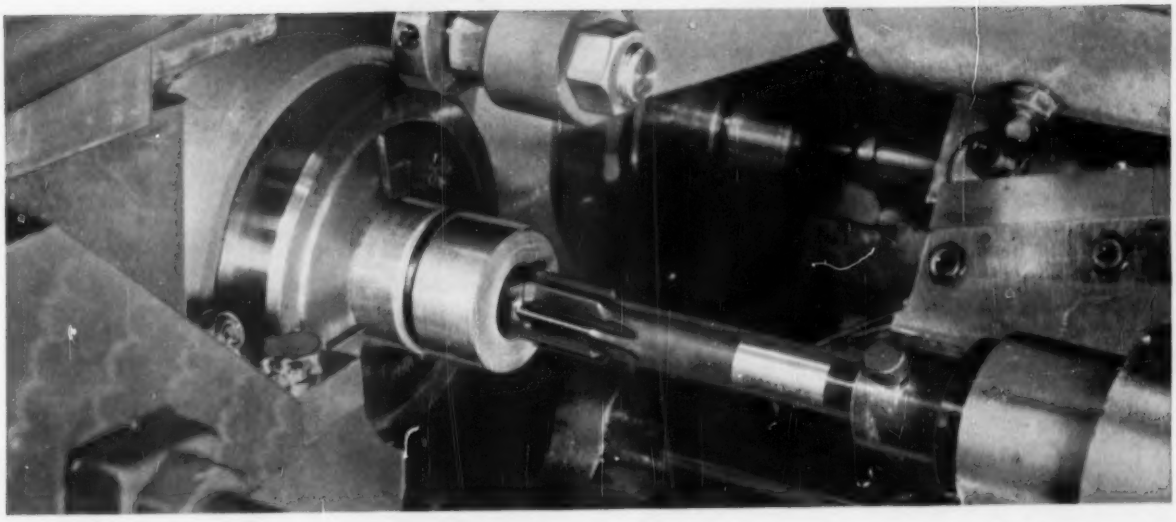
Minimum finishing stock

Fewer finishing operations

Important job economies are being obtained in hole finishing operations with Barber-Colman standard "oil feed" reamers. Close control of size and finish reduces the number of finishing operations required and results in shorter finishing time. Because reamer diameters are held to a tolerance of +.0002", −.0000", reamers can be drawn from stock and put to work immediately on the machines, with assurance of consistent hole accuracy. This eliminates the usual machine downtime for hand working the reamers and size checking.

Through careful tool design and accurate sharpening, reamers are made to suit the specific job characteristics, so that better cutting action produces fewer stresses, and

Barber-Colman Oil Feed Reamer



consequently less distortion in heat treating. As a result, less finishing stock is required for honing after hardening.

Cost savings benefits such as these are evidenced in the Barber-Colman "oil feed" reamers used to size bores in planetary gear blanks. Blank bores are finished within .7536"/.7543" I.D. to 15-60 rms. Since reaming produces blanks within the close tolerances required for accurately cutting the gear teeth, a series of successive finishing operations formerly required have been eliminated, greatly reducing cost per finished hole. Minimum stresses produced as a result of reaming confine heat treating distortion to normal shrinkage of the hole. Consequently, in this case, the hole is reamed to final size, and it is only necessary for honing to remove the amount of shrinkage. The job facts as shown illustrate the production accuracy and finish obtained:

Barber-Colman reamer design produces sharp cutting edges with positive primary clearance on the land, rather than a cylindrical land, to provide a shearing action cut. These sharp edges with irregular flute spacing produce smooth cutting with uniform finish and accuracy which cannot be obtained with conventional reamers. These reamers also have a slight right hand helical flute with an oil hole drilled through the center of the reamer so that the cutting oil will force the chips back between the flutes, contributing to fine finish.

Semi-Finished Bore Diameter	.7536"/.7543"
Maximum Taper Allowable	.0001"
Bore Square and Parallel with Face of Blank	.0003"/.0005"
Concentricity with O.D.	.002"
Production	200 Blanks per Hour
Cutting Time	17 Seconds
Cutting Speed	302 rpm.
Stock Reamed	.008" to .009"
Finish	15-60 rms.
Bore Depth	.820"
Feed	.025"

When you have hole finishing problems involving close limits of accuracy and a series of operations, call a Barber-Colman reaming expert and talk over with him the most economical way to get the finish and accuracy you want. You will find substantial production savings possible, both in cost and time.

BARBER-COLMAN COMPANY

9110 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

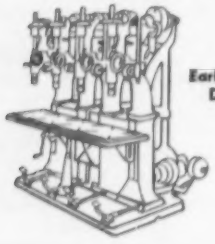
BARBER COLMAN

W. F. & JOHN BARNES

1872 - 1956

FROM

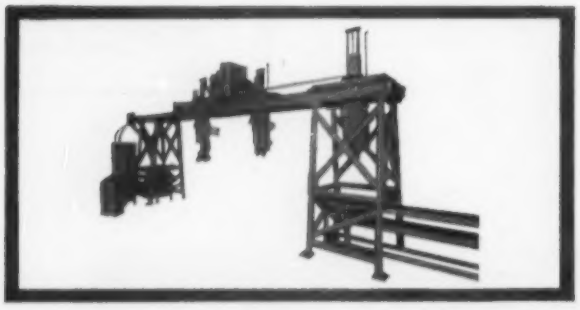
Foot Powered Scroll Saw

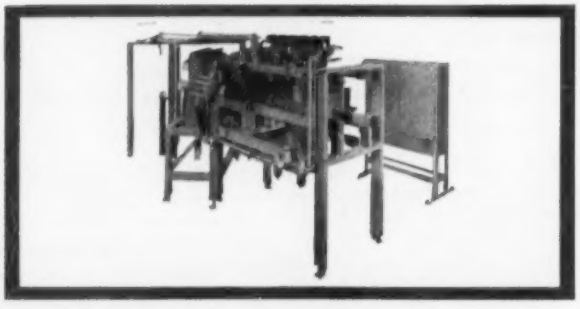


Early Gang Driller

It was back in 1872 when the ox cart was still used for transporting goods and Edison was still experimenting with the electric light, that W. F. & John Barnes built their first industrial machine — a Foot Powered Scroll Saw. Later in the 1880's, the first Gang Drilling Machine was designed and built. This forerunner of the modern machine tools of today was shipped by ox team to a customer in a nearby town. Three days later, the records say, it arrived at its destination — a distance of 40 miles.

It is also a matter of record that all through these years, from oxen to jets, machines bearing the W. F. & John Barnes' name have been consistently associated with progressive developments and improvements in manufacturing methods. As a result, when you specify a Barnes' built machine today, you get a creative engineering and building service that is seasoned by experience — one that is complete and geared to serve your needs better than ever before.





A SPECIAL CONVEYORS — typical of variety of units designed and built from standard components to increase material handling efficiency between machining operations. Engineered to meet individual job requirements.

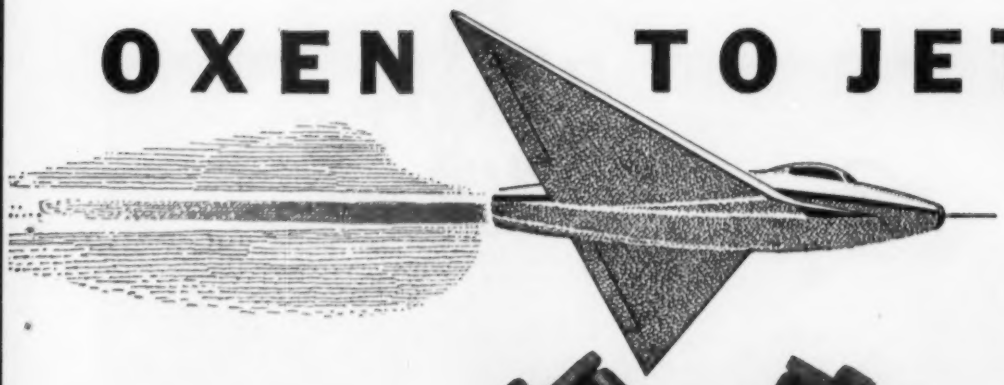
A SPECIAL AUTOMATION EQUIPMENT—includes a range of turn mechanisms, (illustrated), special transfer and unloading equipment, inspection, and assembly machines, designed for automatic or semi-automatic production-line operations.

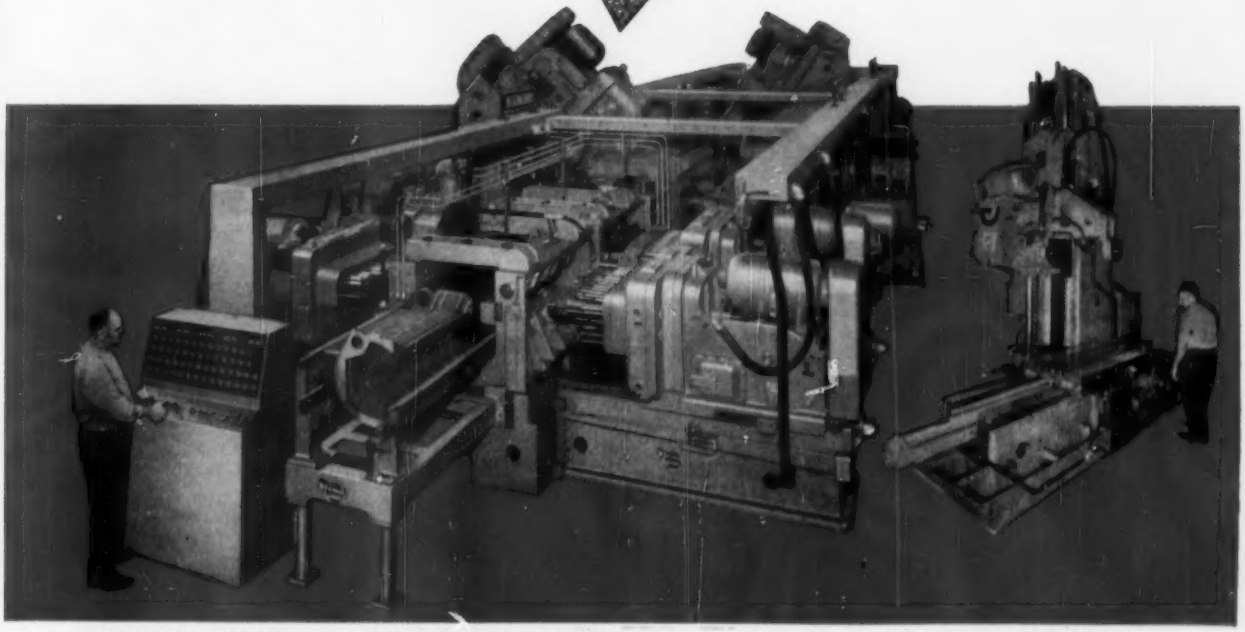
W. F. & JOHN BARNES

BUILDERS OF BETTER MACHINES SINCE 1872

MULTIPLE SPINDLE DRILLING • BORING • TAPPING

OXEN TO JETS





MODERN MACHINE TOOLS — *units illustrated are typical of the large Progress-Thru and Single Station units designed and built by Barnes. 11-Station unit at left was designed to machine both 4 and 6-cylinder tractor engine blocks at 25 pieces per hour. Single-spindle machine at right slab and face mills motor frame mounting pads at 6½ pieces per hour.*

SPECIAL ELECTRICAL CONTROLS — *a typical Barnes unitized control system of the sequence type. All are designed to assure the most dependable service and are built to best serve your specific needs.*

ELECTRO-GRAPHIC DETECTOR SYSTEMS — *a new, exclusive Barnes development. Cuts maintenance time on complex electrical controls up to 90%. Wired-in checking system pin-points malfunctioning elements.*

Write **FOR FREE LITERATURE** — New 8-page brochure illustrates and describes Barnes' expanded facilities . . . outlines 6-Point Coordinated Machine Tool Designing and Building Service.

W. F. & JOHN BARNES COMPANY • 401 SOUTH WATER ST., ROCKFORD, ILLINOIS

MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

New Case "400" Tractor, shown here, is setting new standards of tractor capacity, convenience comfort, appearance and over-all performance.

Many parts of YOUNGSTOWN Steel go to make Case's "new from ground up" 400 Tractor

Not often does a farm equipment manufacturer create an entirely new tractor. Such a change is costly—both in time and in tooling costs. But, the J. I. Case Company of Racine, Wisconsin, did it with the Case "400" Tractor.

Another thing that Case did was to make sure that the "400" would be a quality product. That's why parts such as 4th and 8th speed gear seat reinforcement, rear axle shaft, differential shaft, reverse idler gear, front wheel spindle and many others are of Youngstown Steel. These parts utilize 5 different Youngstown Steel products: Hot Rolled Alloy Bars, Hot Rolled Carbon Bars, Hot Rolled Sheets, Cold Rolled Sheets and Standard Black Pipe.

In all Youngstown Steel products, you will find the same dependable uniformity, because Youngstown controls the complete manufacture from start to finish, with emphasis on quality throughout.

Let Youngstown help you with your steel problems. For information and service, get in touch with the local Youngstown distributor—or phone our nearest district sales office.

Youngstown

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities

SHEETS · STRIP · PLATES · STANDARD PIPE · LINE PIPE · OIL COUNTRY TUBULAR GOODS · CONDUIT AND EMT · MECHANICAL TUBING · COLD FINISHED BARS · HOT ROLLED BARS · WIRE · HOT ROLLED RODS · COKE TIN PLATE · ELECTROLYTIC TIN PLATE · BLACK PLATE · RAILROAD TRACK SPIKES · MINE ROOF BOLTS

CUSTOMER SPECIFIED

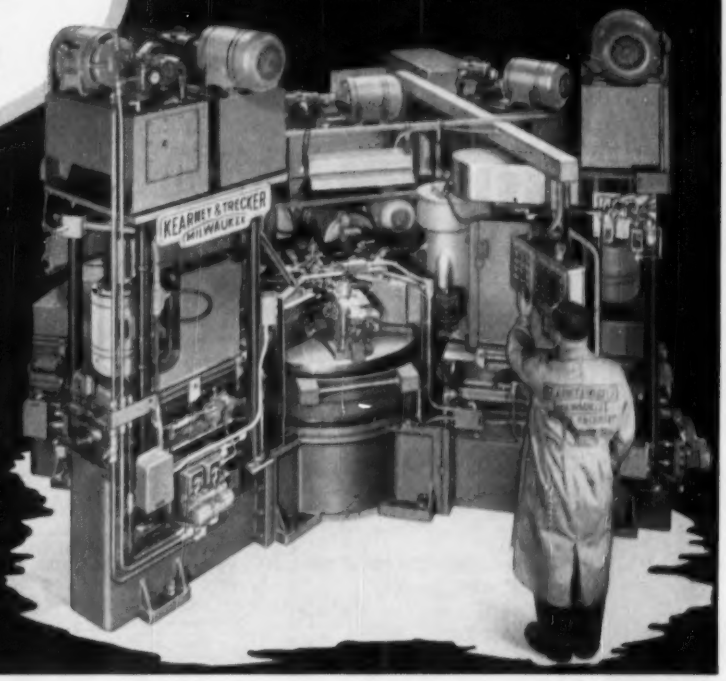
One of the nation's leading manufacturers of communications equipment needed a way to increase production milling of telephone relay frames, reduce unit costs and greatly improve product quality. They called on Kearney & Trecker to solve this problem.

...ifies machined surfaces.

KEARNEY & TRECKER MILWAUKEE® DESIGNED

Here's Kearney & Trecker's answer: Two 6-Station Rotary Indexing machines which mill 24 surfaces on cast iron telephone relay frames within plus or minus .002" at a combined rate of 360 pieces per hour. Former methods produced only 150 relay frames per hour.

An important cost-saving feature of each machine is the application of standard units — five feed slides and a 48" rotary index table. Such utilization of standard units lowered initial costs, simplified maintenance and increased efficiency.



High-volume, low-cost production starts with Kearney & Trecker Milwaukee machine tools

Kearney & Trecker automatic production machines accurately perform many operations at lower cost. But most important to you, this is accomplished by combining standard design components — feed slides, way-type drill units, tapping units, quill feed units, rotary index tables — that keep initial machine costs at a minimum. You get the production you want and the economies you need from job-proven designs. What's more, you get performance to exacting accuracies.

Take advantage of our abilities. See how they can pay off in new profits for you. Whatever your production machine needs, call our representative or write: Special Machinery Division, Kearney & Trecker Corp., 6786 W. National Ave., Milwaukee 14, Wisconsin.

For more information on machine illustrated, ask for Data Sheet No. 1083. A new bulletin, SMD-56, which describes many of our outstanding machine designs, is also yours for the asking.

Designers and Builders of Precision and Production Machine Tools Since 1898

NOW
L&I
introduces

Highest Precision

DRILL &
REAMER
BLANKS

LAVALLEE & IDE, INC.

AVAILABLE
FROM STOCK

Drill Blanks
up to ½" +.0000", −.0003"
over ½" +.0000", −.0005"

Reamer Blanks
up to ½" +.0002", −.0000"
over ½" +.0005", −.0000"

- Fractional Sizes 1/16" thru 1"
- Wire Gage Sizes #1 thru #80
- Letter Sizes A thru Z
- Complete Sets

Any size from .0135" thru 1.0000"!

L&I

"the reamer specialists"
LAVALLEE & IDE, INC.
CHICOPEE, MASS.

Letters . . .

To American Machinist
330 W 42nd St, N Y 36, N Y

Personal Opinion

I suppose it is none of my business, but I am frank to say that I heartily disliked your cover picture (*AM*—Aug 13 '56) The artist may be famous, but if he presumes to picture Metalworking scenes, he should pay more attention to technical accuracy. Take a look at the way those girls are handling pliers, and note the wide span of the plier handles.

If this is modern art, let's revert to the good old Kodachromes that tell us exactly what's going on, instead of leaving us in the middle of a Chinese puzzle.

A T Ritter
Chicago

Our Error

For many years I have tried to teach my students to use the proper terminology in their machine shop work and have used American Machinist as my authority in such matters. Judge of my horror when I came across the expression, "emery paper" in a recent issue (*AM*—Sept 10 '56, p161). I have always insisted on the term, "abrasive cloth," but now I am afraid you have undone years of work by lapsing into that common error. The next time I correct some boy for speaking of "emery cloth," he is likely to say, "But American Machinist calls it that."

Thomas Henderson
Cleveland

We're sorry for the slip. Abrasive cloth, or coated abrasive is, of course, the correct terminology. —Ed.

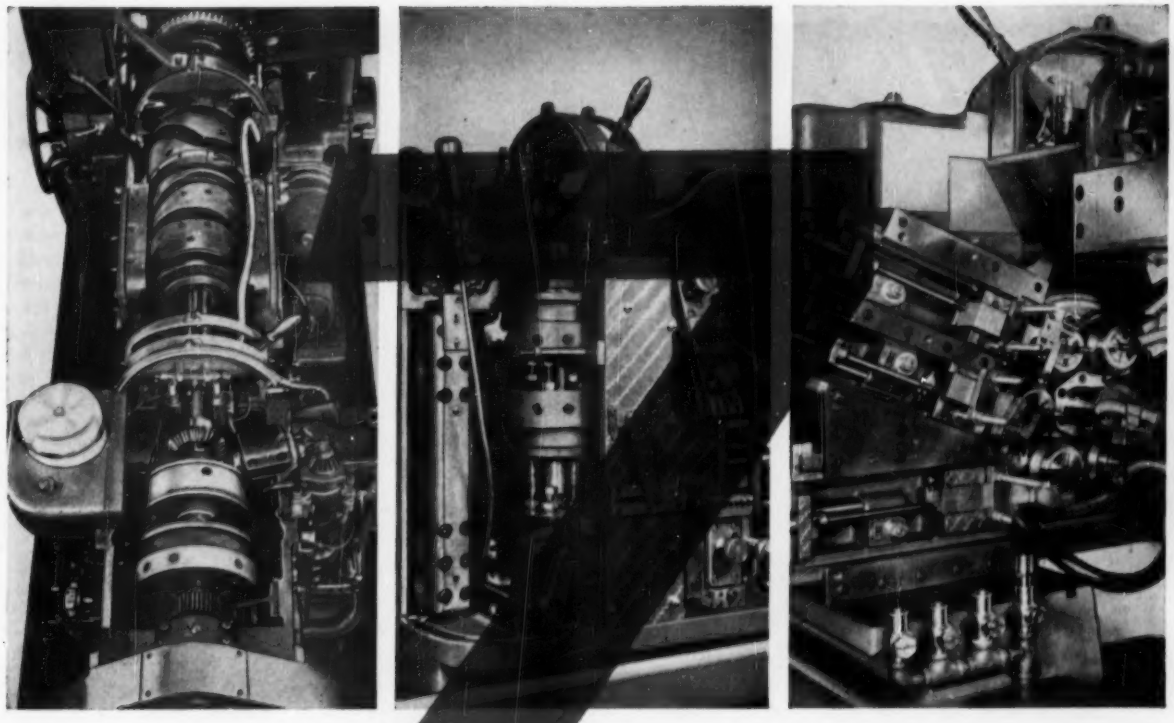
Saw Blade Works

Your recent Special Report on How to Cut Off Metals (*AM*—Aug 13 '56, p133) was excellent coverage of a process that is always

SHOPMATES

N. Jarvis

SAY- AH ... I'M KINDA' NEW HERE ... WHAT SHOULD I DO- LEAVE THIS MESS UNTIL I FINISH THE JOB OR CLEAN IT UP FOR OVERNIGHT ?
AROUND HERE IT DON'T MAKE MUCH DIFFERENCE ... IF YOU DON'T CLEAN UP THEY CALL YOU A SLOPPY HOUSE KEEPER. IF YA DO CLEAN UP THEY ACCUSE YOU OF NOT WORKIN'.
HE ASKED THE WRONG GUY THE WRONG QUESTION· BIG MIKE NEVER DID ANYTHING RIGHT YET..
N. JARVIS

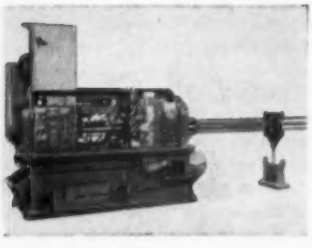


Seven Fast Changeover Models

With the prospects of improved tool materials ever decreasing the actual machining time of work on Multiple Spindle Automatics, long runs tend to become short runs. Facility that decreases the time for job changes becomes more important to low-cost production.

Conomatics are available in as many as seven fast changeover models. These are the 9/16", 1", 1⅝" Sixes, and the 2⅝", 3½", 5", and 5¼" Fours.

These models are equipped with dial adjustment of working stroke of all slides, without making necessary change of total stroke or positive stop settings. Write, wire, or phone for literature descriptive of these features and other facilities available to users, or prospective users.



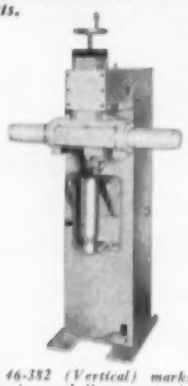
Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

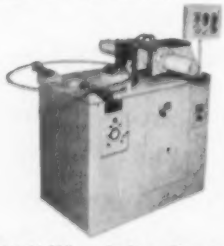
for
✓ Marking round surfaces
✓ Marking flat surfaces
✓ Precision graduating
✓ Serial numbering
✓ Knurling

Model 46-354 marks bearing races 1" to 6" in diameter. Cyclomatic Control and air ejection require operator merely to load piece parts.

The NOBLEWEST Series 46 is a truly new concept in universal roll marking. Its *Dual-Function Head* incorporates a pneumatic pressure ram for depth of mark and a pneumatic die slide for roll marking. Combined in one integral unit, this new design offers wide flexibility in *machine design*—and *work capacity*. As illustrated, the *Dual-Function Head* can be mounted horizontally, vertically or at an angle . . . thus permitting a wide range of product application. Like all its famous predecessors, it employs the original NOBLEWEST roll marking process—producing sharp, permanent, sunken impressions—*good for the life of your product*. Whatever your needs for metal marking, NOBLEWEST makes the machines, marking dies and work-holding fixtures for doing the complete job faster, better, at lower cost. Write Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Conn.



Model 46-382 (Vertical) marks flat surfaces from shell cases to kitchen utensils with equal facility.



Model 46-387 marks large diameter jet engine rings and similar parts.

MARK IT BEST WITH
NOBLEWEST
MARKING MACHINES • MARKING TOOLS

with us and that constantly gives us trouble. As you say in your opening paragraph, cutoff is so common that nobody pays any attention to it, and yet it is often more troublesome and costly than many people realize.

I have been trying out your idea of using a carbide-tipped saw blade as a cutoff tool and am happy to report that it has worked extremely well. I would like to add, however, one point that Mr. Emerson did not stress. When cutting off in a lathe, it is extremely important that all play be taken out of the cross-slide and compound. Unless the gibs are tightened up, the toolpost will kick, causing tool chatter, and the work is likely to override the tool as it nears center, which may cause a bad accident.

R Clarke
Cincinnati

Thank You, Sir

I have never made a practice of writing letters to an editor, either to compliment him or to complain, because I always supposed he got bags of them in every post and I did not think it was fair to burden him further. It never occured to me that he could possibly find editing a lonely job, or that he would really be glad to hear from readers. Perhaps I have seen too many American pictures (Movies—Ed.), but I have been under the impression that editors were always rushing around madly in all directions and were much too busy to be bothered with correspondence that was not, as they say in the pictures, "hot copy."

However, your note on the Chips page (*AM*—Aug 27 '56, p2) has thrown rather a different light on the matter, and I shall feel free to write you when the occasion offers. I have nothing special in mind at the moment, except that I would like to compliment you on producing a magazine that is entirely without peer in this or any other country. It brings me completely up to date on all the developments in your wonderful country and I am afraid I am sometimes envious of the remarkable facilities at your disposal. The crane-mounted drill-press on the cover of the issue in question is a case in point. Its cost must have been tremendous, and even though it undoubtedly paid

for itself within a reasonable time, it would be very difficult to persuade management in this country to make so heavy an investment in such a highly specialized piece of equipment.

I am not a subscriber to *AM* because I simply cannot afford your very stiff price. (That is something I might complain about.) However, I have a good American friend who faithfully sends me each issue, and I can certainly be classified as a reader. I do not believe I would care to live in America—your pace of living is much too fast—but I would dearly love to visit some of your factories. Meanwhile, I find *AM* the next best thing to actually seeing the factories themselves.

Geo A R Fitton
Manchester, England

Self Help

Your editorial in the current issue hits home at one of the most vexing problems facing the vocational instructor. Far too many of our young boys are "condemned" to a vocational course because they do not have the ability to handle the ordinary academic subjects and, as a result, the entire training program is placed undr the stigma of being a sort of poor relation.

Consequently, school boards make only the most meager grants for our machines and supplies. We must hoard every scrap of steel, allowing each boy to make only short cuts so there will be something left for the next boy. We must make do with decrepit machines on which it is impossible to hold accuracy. How then, can we instill into our students any pride of workmanship or any appreciation of machine capabilities?

Industry is forever clamoring for supplies of skilled men, and the demand cannot be met unless industry itself takes an active hand in the matter.

Let employers send capable men to our schools to impress upon our students that good machinists have every reason to be proud of their profession, that dirty hands are a badge of honor, and that, income-wise, they will be far better off than many, or most, of those who choose the white-collar jobs. Let these men show that the day of the strong back and weak mind has passed.

J A Robinson
New York City

REED

Thread Rolling Attachments

Provide Versatile Tooling for Threading Applications at

MUELLER BRASS CO., Port Huron, Michigan

Stronger, smoother threads with less burrs . . . substantial material savings . . . and increased production of approximately 30% . . . are among the many advantages proved by actual quality control records at Mueller Brass Co. after installing REED thread rolling attachments.

Typical Parts Rolled at MUELLER BRASS CO.

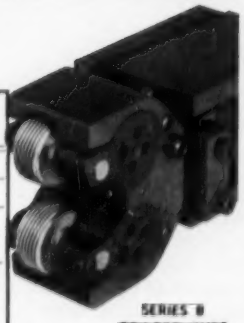
5/16" - 2" Straight Thread Diameters
1/8" - 2 1/2" Taper Thread Diameters
NPT and NPTF (Dryseal)
150 Different Threading Applications
16 Thread Rolling Attachments
4 Different Types of Automatic Screw Machines
ACME-GRIDLEY • GREENLEE
DAVENPORT • NEW BRITAIN

REED THREAD ROLLING ATTACHMENTS are made in FOUR STANDARD SIZES

Model No.	Complete Diameter Range	*Pipe Threads That May Be Rolled	Approximate Number of Common Screw Threads That May Be Rolled
B 10	0 - 5/8"	7	80
B 13	1/8" - 13/16"	9	90
B 18	1/4" - 1 1/8"	15	105
B 36	3/8" - 2 1/4"	18	185

*Straight and Taper Pipe Threads, including Dryseal (NPTF). Change may be made from Straight to Taper Threading by changing rolls only. No other equipment is necessary.

ATTACHMENTS DESIGNED FOR SPECIAL APPLICATIONS



SERIES B GEARED TYPE

Write for Attachment Bulletin B-1

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment
WORCESTER 1, MASSACHUSETTS, U.S.A.

Sales Offices In: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

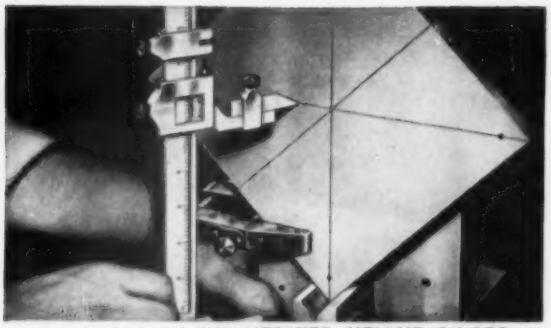
how many Starrett® dial indicators does your shop need?

When your needs are limited, you may find that Starrett Dial Indicator Set No. 253 will handle all your applications. It provides in a handy mahogany case three of the most widely used Starrett dial indicators (ranges .025", .125" and 1.000"; graduated 001", .0005" and .0001").

When your needs are extensive, you can fill all your requirements from the complete Starrett line which includes 140 standard AGD models featuring *Unit Construction* with the entire gear mechanism interchangeable in No. 25, No. 655 and No. 656 Regular and NONSHOCK Indicators for simplified maintenance. There is also a wide range of Starrett dial test indicators, dial comparators, hand gages, pocket gages and similar instruments

When you order Starrett dial indicators and gages, keep in mind all the other items that bear the familiar Starrett trademark . . . mechanics' hand measuring tools and precision instruments, steel tapes, steel rules, hacksaws, hole saws, band saws, band knives and precision ground die and flat stock. All of these Starrett products are available through the same convenient source of supply — your INDUSTRIAL SUPPLY DISTRIBUTOR.

WHEN YOU MEAN PRECISION YOU SAY STARRETT



6, 12, 18 and 24" VERNIER HEIGHT GAGES

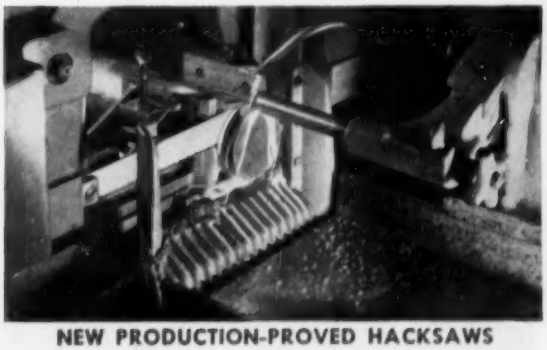
Starrett Vernier height gages are standard equipment in tool rooms and inspection departments for layout, jig and fixture work and precision inspection. No. 454 (shown above) is available in 12", 18" and 24" sizes. 36" and 48" sizes furnished on special order. No. 354 with slotted base available in 6" size.

TUBULAR MIKES FOR BIG WORK

Sizes range up to 168 inches. Bow or bar types with fixed, sliding or interchangeable anvils — also dial indicator heads or special contacts. Light yet rigid for perfect balance, sensitive feel and easy handling.

NEW MAGNETIC BASE INDICATOR HOLDER

No. 657 has off-on push button for one-hand setup plus universal adjustment and other exclusive features. Uses any Starrett "Last Word," No. 196 or No. 25 Series dial indicator.



NEW PRODUCTION-PROVED HACKSAWS

New Starrett Hacksaws are Color Identified for quick selection and Production-Proved to give you the performance you need for any metal cutting job. Starrett also makes Band Saws, Band Knives and new Safe-Flex® Hole Saws.

NEW SAFE-FLEX® HOLE SAWS

Use these new double-welded, shatterproof hole saws for cutting large diameter holes in metal, plastic, wood. Interchangeable arbors hold a wide range of saw sizes. Shanks fit portable power tools, lathes, drill presses, etc.

PRECISION GROUND DIE AND FLAT STOCK

Over 1000 sizes precision ground to Starrett standards of accuracy. Available in oil, oil and water, water or air hardening types. To save valuable man and machine hours, just "lay it out . . . and saw it out."

BIG NEW CATALOG NO. 27

Describes and illustrates the complete Starrett line. Ask your Industrial Supply Distributor or write for free copy. Address Dept. C.

SEE THE STARRETT EXHIBIT
SPACE 919
National Metal Show

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR
Prompt delivery
Dependable service
Quality products

Starrett

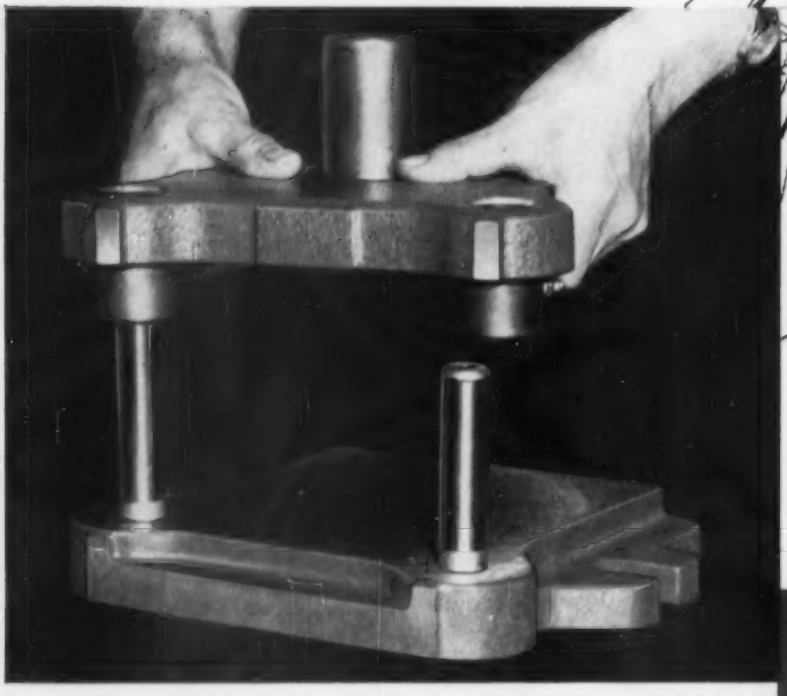
SINCE 1880
WORLD'S GREATEST TOOLMAKERS

HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES
THE L. S. STARRETT COMPANY, ATHOL, MASSACHUSETTS, U. S. A.

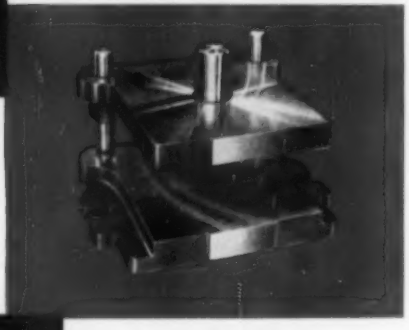
NEW

Easy Punch Holder Removal

ON NEW DANLY DIE SETS



Danly's leadership in die set design is seen in another improvement . . . easier removal of punch holders. On ordinary sets, punch holders often bind near the top of the guide posts as they are being removed. Standard Danly Die Sets are assembled with one post a half-inch shorter than the length specified . . . thus, the punch holder swings free before binding can occur. Isn't this another important reason why you should specify die sets from Danly?



complete new
"leadership line" catalog
More than 200 pages provide you with complete design information, easier selection of die sets and supplies.
Write for your copy today!

DANLY MACHINE SPECIALTIES, INC.

DANLY

2100 South Laramie Avenue
Chicago 50, Illinois

Spot news...

NEWS REPORT

- **More complex powder-metal parts now are in demand**. Despite odd shapes and projections, items that would not long ago have been made in two or more compacts and then assembled are now made in a single piece. Press builders accordingly have had to put more motions into their equipment so customers can save on assembly costs.

- **What the aircraft industry will need the next 10 years:** 1) Materials withstanding temperatures up to 3500 F; 2) new inorganic adhesives to serve as high-temperature bonds in sandwich construction; 3) completely new materials such as foamed metals.

- **Three US lathe builders are reported interested** in producing a new screw-cutting lathe developed by a Brazilian firm—Industria de Maquinas Agricolas Romi S A of Sao Paulo. This firm now makes the Romi-Isetta small automobile. The new lathe has gear box with automatic and synchronic controls allowing the manufacture of 384 different screws without changing gears.

- **With more women being used for assembly work in metalworking plants,** safety features of small bench-type presses are getting more attention.

- **Largest cold-forging machine ever made**—a giant bolt-maker being built for Cleveland Cap Screw Co at cost of $500,000—will produce 1½-in. dia bolts so fast that it would take a plant with $2.5 million of conventional equipment to equal the output.

- **Fringe benefits now amount to $819 per factory worker per year,** an increase of $99 over 1953, US Chamber of Commerce says. Breakdown is like this: $254 for pensions and insurance, $254 for vacations and holidays, $145 for legally-required programs, $89 for rest periods, $77 for miscellaneous benefits.

- **East German machine tool builders have been offering to West Germans** types of machines on the embargo list set up by western countries against shipment to communist nations.

- **Consulting engineering services in sheet metal are springing up,** spurred by the fact that the engineers who design the product too seldom have shop knowledge. Managements find that consultants often can clean up the designs to save costs and especially can write adequate specifications so that truly competitive bids can be secured.

- **Air-suspension systems for automobiles are a certainty for 1958 models.** Sign-of-the-times: General Motors' A-C Spark Plug Division has set up an engineering group to develop pneumatic-powered components for cars.

- **Detroit's demand for complicated automation devices on new machine tools** is lengthening by as much as five months the time needed by builders to produce special machines. For details, turn to p 107.

Spot index to major News stories...

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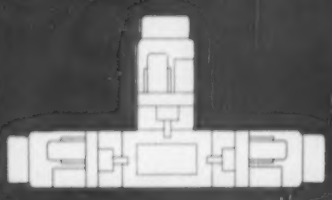
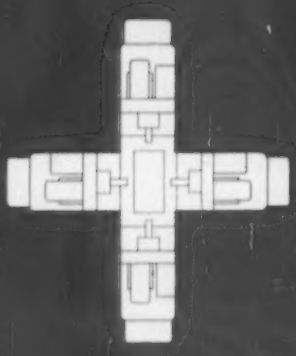
ONE WAY

TWO WAYS AT 180°

TWO WAYS AT 90°

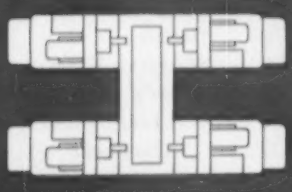


THREE WAYS



FOUR WAYS

MULTI-WAYS



MULTI-WAYS

Ex-Cell-O 4-Way Machine precision bores four holes simultaneously, holding 90° angles.

7 ways to increase your production

Three new features on all Ex-Cell-O Way Machines give even greater production and precision

The diagrams at left tell a story.

Ex-Cell-O Way Machines using standard components in the combinations illustrated perform precision boring, turning, facing, grooving and chamfering operations economically and quickly. They take large work pieces in stride—the spindles move to the work.

In each machine three new features assure long life, dependable operation, and exceptional accuracy.

The features: (1) ways are hardened and ground, (2) slides are fully supported the length of the stroke, (3) hydraulic control panels give a wide range of automatic cycles.

Write Ex-Cell-O in Detroit for further information. Better still, call in an Ex-Cell-O representative.

EX-CELL-O CORPORATION

EX-CELL-O FOR PRECISION

XLO

DETROIT 32, MICHIGAN • Manufacturers of Precision Machine Tools • Grinding Spindles • Cutting Tools • Railroad Pins and Bushings • Drill Jig Bushings • Aircraft and Miscellaneous Production Parts • Dairy Equipment

56-44

Washington ... NEWS REPORT

Added tax aid for steel unlikely . . .

Washington is still grappling with the question of a new round of accelerated tax amortization to spur steel industry expansion. Latest indication is, however, that the administration will turn thumbs down on the bulk of all proposals to grant added five-year writeoffs on the grounds of defense essentiality. Twelve steel firms have applied to ODM for fast amortization on general plant expansion projects costing $1.4 billion. Right now, the only steel product formally still eligible for five-year writeoffs is heavy plate used to build ships, tanks, etc.

The steel producers claim expansion of other capacity would also bolster the defense program. They have pushed their case and lost.

Both ODM director Flemming and Treasury Secretary Humphrey oppose the new round of steel amortization as a defense incentive. Their position is that the capacity expansion needs stem solely from growing civilian demand, that defense needs are not great enough to justify special tax benefits. Besides, the feeling is that steel firms are likely to go ahead with most if not all of the expansion plans even if the added tax aid is not granted. Commerce Secretary Weeks, who has supported the steel proposal, is now less enthusiastic.

Military skilled manpower shortage

An advisory committee headed by General Electric President Ralph Cordiner is about to submit proposals on the retention of scientific and technical personnel in the military services. The shortage of skilled manpower to handle the growing volume of complex new weapons and equipment has long been a big headache for the Defense Dept. For the past five months, the Cordiner Committee has been studying the problem, is now drafting proposals to reduce it.

Major proposals in the works deal with pay incentives and related matters. But also under consideration is a plan to reduce the military's need for skilled men. This would involve (1) increased use of private contractors to maintain and repair military weapons and equipment, and (2) simplified equipment design and maintenance procedures.

Proposals for lead time reduction . . .

A top-level Pentagon committee has recommended to Defense Secretary Wilson new ways to cut lead time from initial research to production of new aircraft. Major recommendation is that added authority and responsibility be granted to private contractors and lower-echelon military procurement offices.

Present lead times range from four years for most new fighter planes to as much as nine years for bombers—about the same as in World War II. Meantime, Russia's are about the same.

The committee said much of the development delay stems from the red tape and bureaucratic setup involved in making key decisions. The Committee called for "more timely and better informed" decisions and new programs—for instance, tests to set potential uses of proposed new weapons held while requirements for the arms are being prepared. A current "obstacle to securing strong military motivation and firm decisions," it said, is "the absence of agreed-upon military applications." It also proposed "simpler procedures" in military-contractor relationships —wider dissemination of technical data and requirements to contractors and faster action.

Steel productivity going up . . .

Productivity of basic steel workers has gone up at an average annual rate of 2.9% in the past eight years. Latest figures show that output per manhour has varied during the period, however, in line with the industry's output. In 1950, for instance, productivity went up about 9% over the previous year, accompanied by a big boost in ingot production. Last year, with another spurt in output, worker productivity increased about 11% over 1954. In the preceding year, there was a 2½% drop in output per manhour. Bureau of Labor Statistics credits both technological improvements—larger furnaces, automatic controls, growing use of continuous milling, and the like—and improved labor-management relations as factors in the productivity hikes.

Take-home pay at record high . . .

Take-home pay of U S factory workers hit an all-time high in August. BLS says the average factory production worker with a wife and two children carried home a paycheck averaging $73.06 per week; a single worker with no dependents, $65.71. Both figures were about $2.70, or roughly 4%, higher than August 1955. Higher prices cut somewhat into the purchasing power. But BLS says nevertheless that the take-home pay represented a boost of about 2% in buying power over last year and that the factory worker could buy more goods and services in August 1956 than in any August before.

PRECISION PERFORMANCE...

To the navigator, precision performance means the skillful manipulation of his sextant to ascertain the exact latitude and longitude of his ship.

To tap users, precision performance means production-line continuity, better threaded parts, increased tap life . . . and BAY STATE!

BAY STATE TAPS

Bay State Tap & Die Company

Mansfield, Massachusetts

On the shelves of your local Industrial Supply Distributor

Detroit ... NEWS REPORT

Round One–1957 . . .

The gloves have been waved aside as Ford and Chevrolet step in the pre-model-introduction ring—neither opponent wants to be bothered with such niceties as Marquis of Queensberry rules. From here on out it's bare knuckles.

The acknowledged champ, Chevvy, led off with new general manager Ed Cole saying "They (Ford) have to get up off the canvas before they start swinging."

Then Ford floored Chevrolet momentarily with a flat announcement that Ford prices would go up only 2.9%. Cole bounced back with this one, "No one in GM, not even Harlow Curtice, knows what the price of a Chevrolet will be, but we can say that it will be competitive."

- **Both Ford and Chevrolet** expect a better-than-1956 model year (no surprise to anybody), and both expect a market of around 6.5-million cars and 1-million trucks in 1957.

- **Ford is shooting for an increase** in its share of the market (about 22% of the market for the Ford nameplate alone. Chevrolet is expected to rack up about 28%.)

- **Chevrolet has done a big job** in engineering changes for its '57 models, plus a facelift that makes for a new-car look.

- **Ford has spent $209 million** to produce a completely new car from the inside out. And, in the opinion of some observers, may have outstyled Chevvy for the first time in many years.

- **Ford will emphasize safety and dependability**—for a while. Then Ford will come out swinging from a new angle because Chevrolet's Cole has said "Motorists are just as intrigued with horsepower as they ever were, and we are going to give them what they want."

- **Ford will undoubtedly counter** with fuel injection for the Thunderbird—either at the 1957 introduction of the T-Bird or shortly thereafter . . . and the T-Bird's fuel injection system will undoubtedly be optional on regular Fords, too.

As the battle gets hotter . . .

But the really big news lies not so much in what will be introduced when the new models take over the showrooms—although styling this year will cause many an eyebrow to lift—but in what will come during the course of the model year as the battle grows hotter and hotter.

One possibility is Bendix Aviation's new fuel injection system, which couples tried and true aviation components with electronic control of the injection system. Veteran engineers like it.

But Bendix won't put the system into any '57 car that doesn't have a completely remodeled intake manifold system. Even at that, Bendix says it has several automakers interested.

All of the automakers, in fact, are working on fuel injection systems for their own models. GM, with one system already in production, is reportedly working on an electronic system similar to Bendix's. At least two of the Big Three, Ford and GM, can be depended upon to come out with fuel injection as a running change in '57 models—even though it means much retooling.

Upcoming engine developments . . .

Look for a major revolution in the reciprocating engine as its proponents fight off possible inroads of gas turbines and free pistons.

A complete retooling change for engine production will come about in the next four years, spokesmen for three major automakers say:

- **The engine is going to look different**—lower, flatter (possibly with opposed pistons), lighter. Now, engineers say they've reached the once-unattainable goal of 1 hp per 1 lb of engine weight. To do this, they must use much more aluminum, also turn to aluminum iron for many parts.

- **Pistons,** now generally less than 4-in. dia and usually with a stroke about the same length in inches as the diameter of the piston, will undergo a tremendous change. Already tried successfully are pistons measuring 5 to 7 in. dia with a 1-in. stroke: compression ratio—17 to 1. Crankshafts will be changed with this new piston—probably straight shafts with eccentrics.

'57 production situation . . .

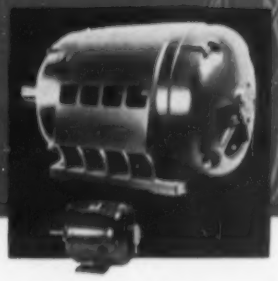
As September ended, all Chrysler plants were down except for hand building of show models. Despite delays in getting parts and some shortages of structural steel, all the Chrysler lines should be rolling along about now on '57's.

Ford assembly plants are on 20% overtime schedules. Lincoln is in production and shooting for a 26% to 40% output increase this year. Mercury is just about ready to go on '57 models.

Over at GM, Chevvy started production October 1; Pontiac will go the middle of this month: and so will Olds.

The independents: AMC and Studebaker are both in '57 production. Packard may bow in January with a slightly reworked model.

Why not build the cart before the horses?



Just tell us here at Master what you want in power drives—and get the utmost in flexibility, compactness and performance. It probably won't be as complicated as the multi-shaft Gearmotor illustrated here, with 14 shafts turning at diverse speeds. But, regardless of what you need, Master can supply the right combination of horsepower, shaft speed and mounting features with whatever Master components are required—all combined in one compact efficient unit. Just ask for information.

Motor Ratings. 1/8 to 400 H.P. All phases, voltages and frequencies.

Motor Types... Squirrel cage, slip ring, synchronous, repulsion-start induction, capacitor, direct current.

Construction .. Open, enclosed, splash-proof, fan-cooled, explosion-proof, special purpose.

Speeds..... Single-speed, multi-speed, and variable speed.

Installation.... Horizontal or vertical, with or without flanges and other features.

Power Drive Features..... Electric brakes (2 types)—5 types of gear reduction up to 432 to 1 ratio. Mechanical and electronic variable speed units—fluid drives—every type of mounting.

THE MASTER ELECTRIC COMPANY, Dayton 1, Ohio

Machine tools ... NEWS REPORT

Detroit places 1958 tooling . . .

Detroit, traditionally the biggest market for machine tools, has been busy lately placing tooling orders for 1958 models.

Most of the 1958 tooling programs, in fact, have been parceled out to machine tool builders. This is particularly true of mammoth special units.

More extensive incorporation of automation into automotive production lines is lengthening the time that it takes for builders to produce machines for Detroit. As many as four to five months have been added to the manufacturing cycle, some builders say, because of the large amount of engineering work and the complexity of the automated devices that form almost an integral part of the machines.

This lengthened lead-time has already had a disruptive effect upon the program of at least one automobile company that had planned to introduce a brand-new engine in 1958.

This company has found that it will not be able to secure deliveries of machine tools, many of them highly automated, in time to put the engine into its cars scheduled for unveiling a year from now. The management thus has been forced to postpone use of the new engine until 1959.

Sales are healthy . . .

Machine tool sales have been thriving. New orders in August, stimulated by the desire of users to buy before higher prices took effect, rose to $87 million. That made August one of the better months of the year. For the two previous months, net new orders had been $61 million a month.

The big gain in August boosted the industry's total bookings for the first eight months of the year to $657 million. It means that for the year as a whole, it now is reasonable to expect that net new orders will match 1955's $927 million.

The physical volume of business booked probably won't be as great as last year because the total will be inflated by price increases.

The big push in new business last year came in the fourth quarter, as an aftermath to the Chicago Machine Tool Show. Some 40% of the year's sales were made within that period.

Machine tool shipments in August rebounded to $75 million from the July figure of $65 million, which was held down by vacation closings. That brings the year's total to September 1 to $558 million. It now appears that shipments for the year will run at least $850 million and may well be a little higher. Shipments in 1955 came to $670 million.

East Germans sell to the West . . .

West German officials are said to be fed up with certain provisions of the western embargo on machine tool shipments to the Communist bloc. They point out that East Germans have offered to them in recent months machine tools that are on the so-called black list.

The ironic aspect of the situation is that East German machine tools may actually play a part in tooling West German armament plants.

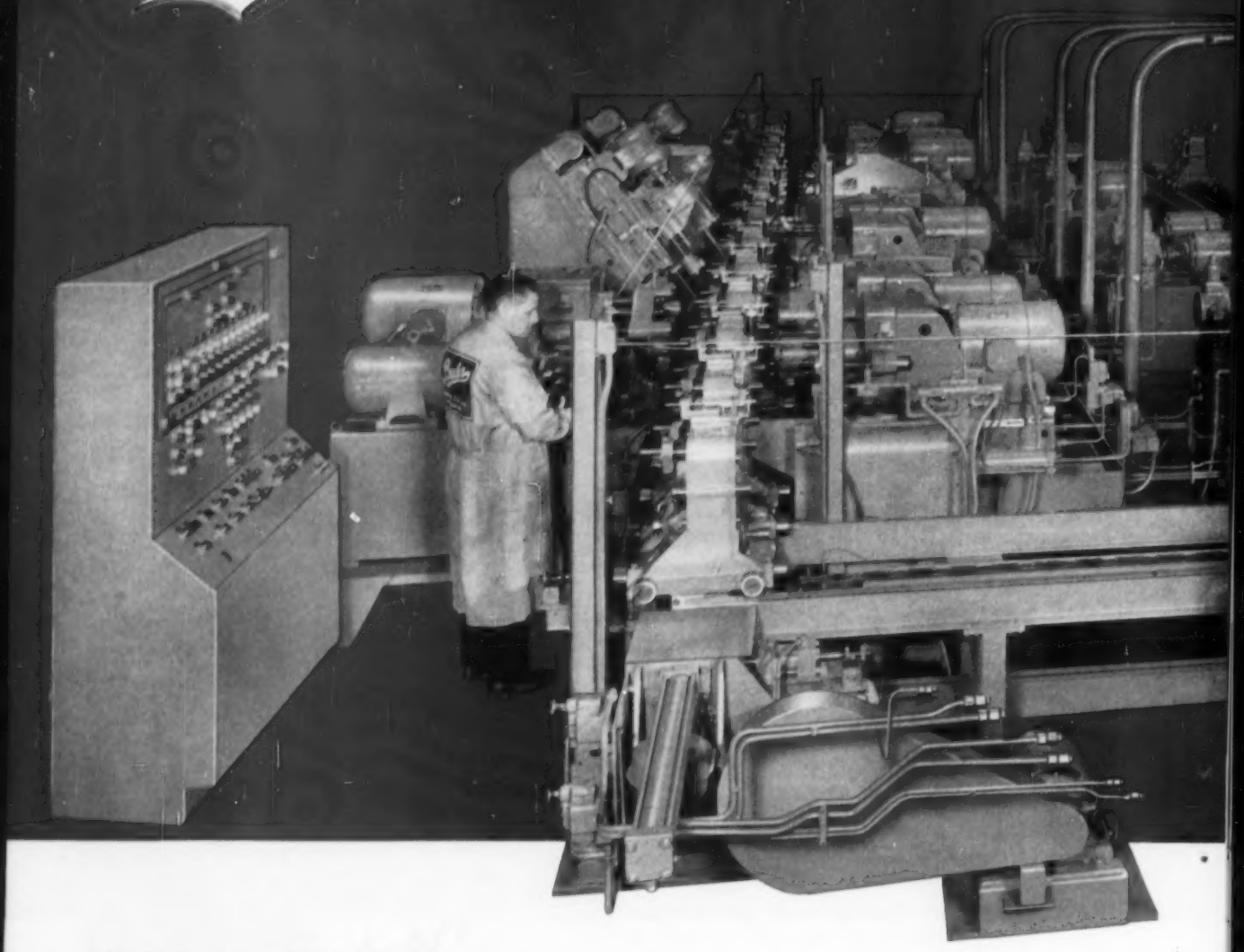
In 1955, Germany's East Zone sent machine tools valued at DM 20 million (over $5 million) to West Germany. During the same time, West German shipments to the East Zone were only DM 1.9 million.

West Germans are reported to be buying some East German machines because "we used them before the war." Niles gear grinding machines are being imported from East Berlin and Chemnitz, despite the fact that the same model is made in West Germany.

WITH SUMMER VACATIONS AND SLOWDOWNS OVER, both new orders and shipments rose sharply on the National Machine Tool Builders' Association Index for August. New orders rose from $61.9 million in July to $87.4 million in August. In the same period shipments jumped from $65 million to $75 million

Buhr ECONOMATIC

(15 STATIONS)

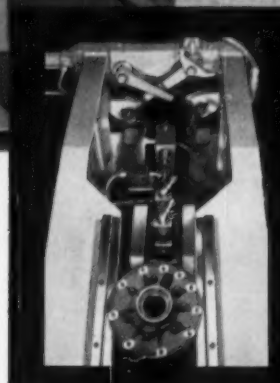


- Parts automatically clamped
- Automatic probing of tapped holes and deep holes
- Hydraulic back-up for heavy trepanning operations
- Automatic unloading of parts
- Exclusive Buhr Detector System in main console, signals and locates electrical failures instantly
- Fixtures washed on return to loading station
- Sectionalized bases to facilitate future part changes
- Automatic lubrication of all moving parts including fixtures
- All standard and special parts interchangeable for ease of maintenance
- Spindles arranged for pre-setting of cutting tools to minimize downtime for tool changes
- Hardened-and-ground steel ways
- J.I.C. Standards throughout

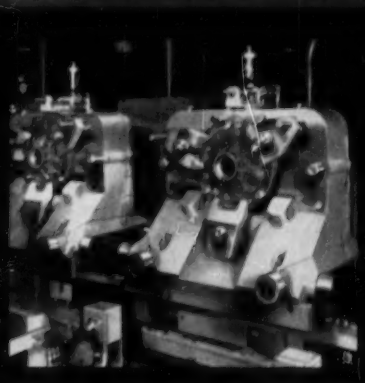
performs 55 operations every 23 seconds!

OPERATIONS...

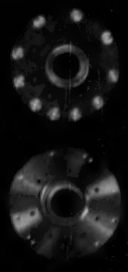
21 drilling, 10 spotfacing,
3 rough and semi-finish trepanning, 2 reaming,
1 end-milling, 1 semi-finish bore,
1 finish bore, 7 tapping and 9 probing



CLOSE-UP OF AUTOMATIC UNLOAD STATION



CLOSE-UP OF FIXTURE



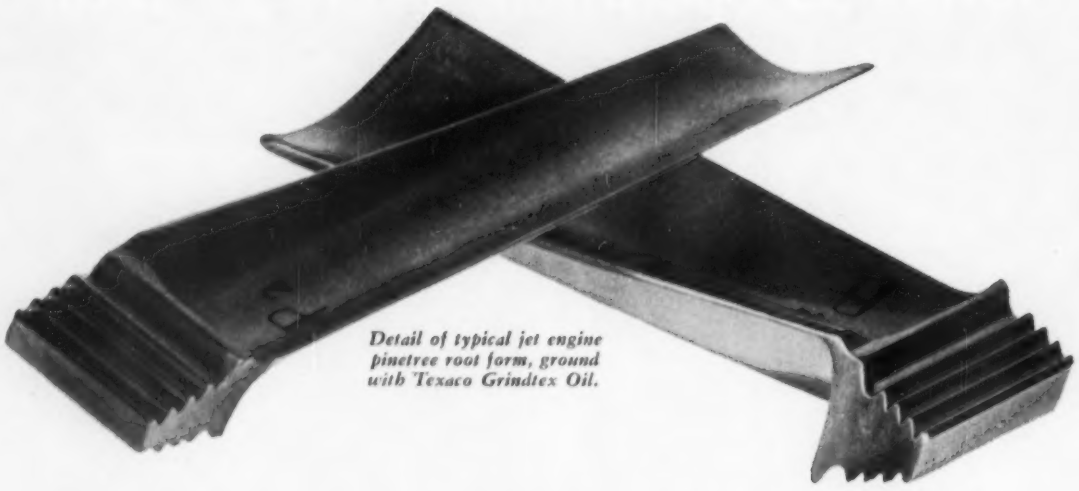
PART . . . automotive front pump-body

Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

BUHR MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers



Detail of typical jet engine pinetree root form, ground with Texaco Grindtex Oil.

Grinds more "pinetrees" between wheel dressings

UTICA DROP FORGE is one of the country's top producers of jet engine blades—doing the complete job from vacuum-melting the alloy to precision forging and finishing.

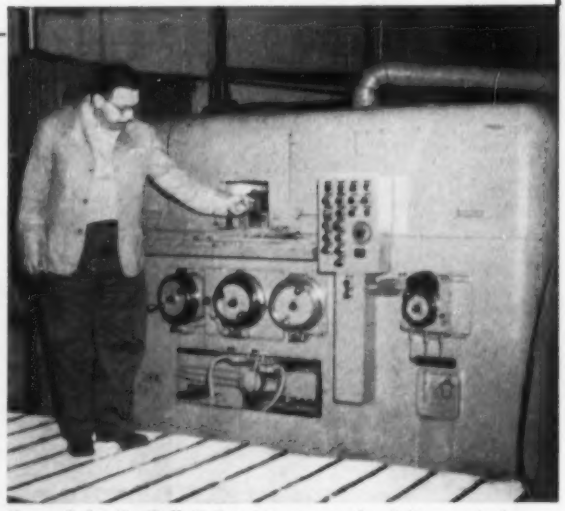
For the critical form grinding of pinetree and dovetail roots, as well as air foil contours, a Texaco Lubrication Engineer recommended *Texaco Grindtex Oil*—and its use has proved outstandingly successful.

Utica Drop Forge finds *Texaco Grindtex Oil* an important help in holding to the required close tolerances and achieving consistently excellent finish. Wheels last longer and fewer dressings are needed. These benefits add up to a higher output of perfect parts at a lower unit cost.

Be sure you're getting the most from *your* machines. There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do *all* your machining better, faster and at lower cost. A Texaco Lubrication Engineer will gladly help you select the proper ones.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, New York.



One of the Ex-Cell-O Precision two-wheel form grinders at the Clayville, New York, plant of Utica Drop Forge & Tool Corporation. Adapted Norton and Thompson grinders are also in use. Metals worked are Nimonic 80 and 90, Iconel 700, Stellite and stainless steels. *Texaco Grindtex Oil* is doing a great job here.

VISIT Texaco Booth 1602, Metals Show, Cleveland, October 8-12

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

What's ahead ... in Metalworking

NEWS REPORT

Fourth quarter to set new peacetime record . . .

Metalworking operations are heading toward a new peacetime peak this fall. It now appears that the fourth quarter will be the biggest 90-day production period ever achieved by the metalworking industries outside of the war years.

The upswing started in August. In that month the American Machinist Index of Metalworking Production rose four points, from 170 to 174.

September is estimated to have been one point higher than August. It is a good guess that October will push up still higher, though the rise from September may be very modest.

Durable goods give support . . .

That Metalworking is getting its best support from the capital-goods industries is shown by the American Machinist Index. The "Machinery" component is put at 158 in August, compared with 153 in July and 139 in August a year ago. The September figure, not yet available, will be up from August's.

The category that includes the plane industry and railroad freight cars showed a big rise, from 335 in July to 357 in August (against 315 in August 1955).

Electrical machinery producers are doing exceptionally well too. Their output is inching up.

The automobile industry has been the weakest segment of all. But it is on the mend. Assemblies in the fourth quarter should be very large.

Auto parts companies are feeling the stimulus of sizable releases from Detroit. Sample: One firm got capacity orders by October 1 and will run full the remainder of the year. Another company reports September shipments 20% better than August's, with prospects good for months ahead.

Auto makers, nevertheless, have been cautious in giving steel orders, preferring to play it safe rather than be caught with heavy inventories in case 1957 models were not a roaring success.

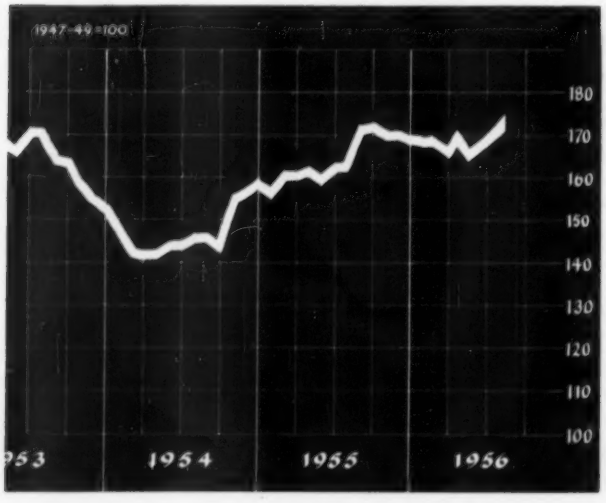
Freight car output rises . . .

Railroad freight car people are getting back to normal after disruption of the steel strike.

Pullman-Standard, for one, now has its Michigan City, Ind, plant back at 60%, with 1200 men at work. It will reopen its second assembly plant when steel is at hand, but this is some time off. Freight car plants at Bessemer, Ala, and Butler, Pa, are almost up to full operations again. Pullman-Standard's backlogs will keep things humming most of 1957.

One diesel-electric locomotive builder has enough business for new locomotives to carry it through the next year. Its rebuilding orders will take up all its rebuilding capacity until next spring.

The farm implement industry probably is the weakest in all of Metalworking. Sales are relatively slow and no appreciable improvement is expected before March. The continuing rise in farm income is encouraging, but it will not be translated into purchases of farm machinery and tractors this year.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

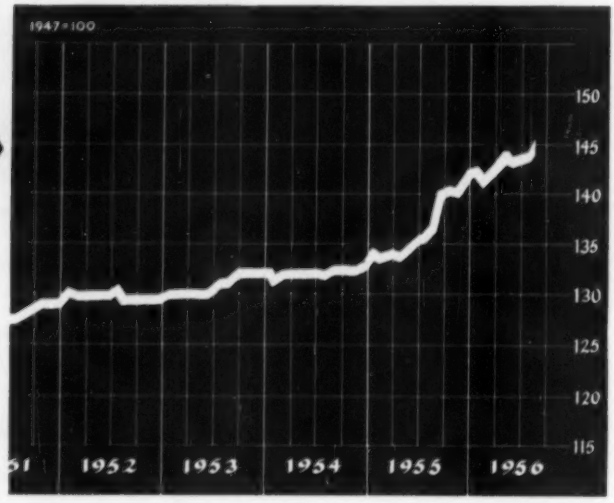
	SEPT. Estimated	AUG. Preliminary	JULY Revised	AUG. Year Ago
Total Index	**175**	**174**	**170**	**170**
Machinery	158	153	139	
Electrical Machinery	211	209	205	
Autos	101	107	139	
Other Transportation	357	335	315	
Other Metalworking	141	138	141	

NEWS REPORT

What's ahead . . . in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	SEPT. Esti-mated	AUG. Pre-liminary	JULY Re-vised	AUG. Year Ago
Total Index	**146.0**	**145.4**	**144.6**	**137.1**
Metalworking Machinery	167.6	165.8	156.7	
Other Machinery exc. Electrical	153.1	152.6	142.6	
Electrical Machinery	143.8	143.0	132.9	
Fabricated Metal Products	138.5	137.6	132.4	



Money is going to stay tight . . .

Tight money will probably be with us for the rest of this year and well into 1957, and inflationary pressures won't ease until then.

Probably the most important single cause of inflationary pressures is business's record investment in plant and equipment—expansion plans that have put a strain on available credit.

Main trouble is that there just aren't enough workmen and materials to go around to build all the projects businessmen have in mind these days. That means too much money scrambling for too few materials and too few people to make something out of them. That's why the Federal Reserve Board has put the screws on credit.

One of the best ways to raise the discount rate: (charge a higher rate of interest to banks borrowing from Federal Reserve).

That means that when demand for money is heavy banks must either charge their own borrowers a higher rate of interest or themselves cut down on borrowing from Federal Reserve.

When this happens, small businessmen feel it more than the big firms. Reason: when the banks can't take care of everybody who wants money, they naturally take care of top credit risks first and let the rest fall by the wayside. And that means your banker will take a lot longer and more thorough look at any loan request.

But even the current high discount rate, the highest since 1933, hasn't much chance of holding off inflation. With businessmen showing no signs of abandoning vast expansion programs, it looks like only greater output and productivity will halt the spiral.

WEEKLY BUSINESS INDICATORS

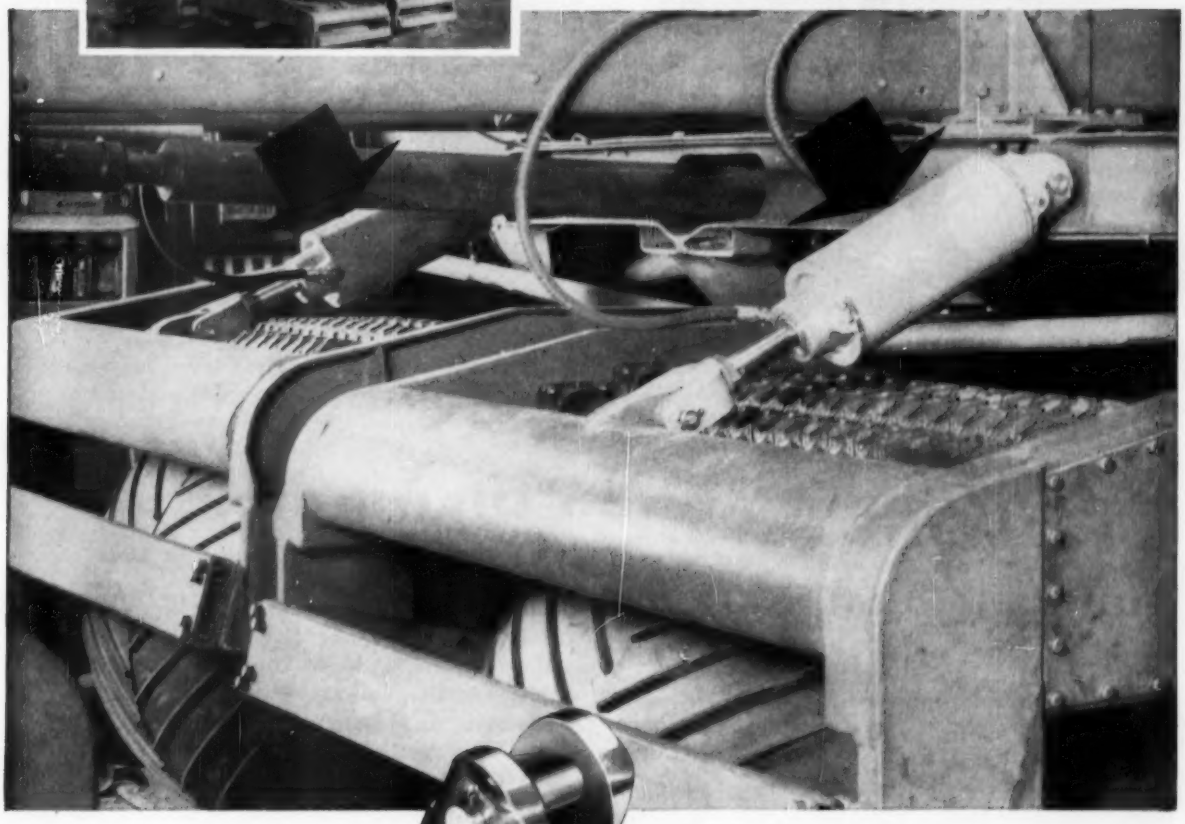
	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	146.7	147.7	142.7
Steel ingot operation (thousands of tons)	2,466	2,477	2,341
Electric power output (million Kilowatt hours)	11,482	11,339	10,756
Production of automobiles and trucks	57,889	86,738	151,804
Engineering construction awards (Eng. News-Record—millions)	$483.4	$380.7	$260.0

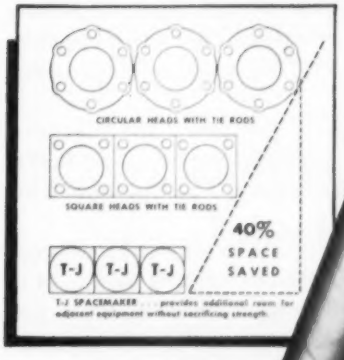
MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
New Orders for machinery*	156	164	136
New contracts for industrial construction*	219	214	171
Index of industrial production (1947-1949=100)*	141	136	140
Index of durable manufacturers' production (1947-1949=100)*	159	148	158
Durable goods manufacturers' sales, millions*	$12,501	$13,850	$13,503
Machinery manufacturers' sales, millions*	$ 4,006	$ 3,923	$ 3,475
Durable goods manufacturers' new orders, millions	$13,497	$14,185	$13,571
Machinery manufacturers' new orders, millions	$ 3,979	$ 4.311	$ 3,656

* Seasonally adjusted

Arctic Cargo Carrier Depends On T-J *Spacemaker* CYLINDERS




CIRCULAR HEADS WITH TIE RODS
SQUARE HEADS WITH TIE RODS
40% SPACE SAVED
T-J
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T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

ALL MODELS . . . OFF SHELF DELIVERY

MEETS WITH ALL JIC RECOMMENDATIONS

Saves 40% Space!

No Tie Rods For Greater Strength

Differential axle loading through T-J Spacemaker Air Cylinders forms a controlled walking beam in this Teracruiser, designed and produced for the Army Ordnance Corps by the Four Wheel Drive Co., Clintonville, Wis.

Weight of cylinders was important factor in choosing T-J Spacemakers, which reduce weight while providing same displacement and extra high safety factor. Fast delivery and space-saving features also favored T-J. Exclusive with T-J are new Super Cushion Flexible Seals for Air (to 200 P.S.I.) . . . and New Self-Aligning Master Cushion for Oil (to 750 P.S.I.). Hard chrome plated bodies and piston rods are standard, at no extra cost. Wide range of styles, capacities . . . 64,000 combinations *off the shelf!* Write for bulletin SM-155-3. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON

RIVETORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

Independent Armco Distributor

averts plant shutdown with two-hour delivery

A vital part failed, threatening a metal fabricator with total shutdown. Experience told him what to do. He quickly phoned the part specifications to his Armco Steel Distributor. Two hours later the flame-cut plate he needed was at the airport, where it was picked up by his plane. A costly shutdown was averted.

"Rescue" service, illustrated by this actual case, is only one of the valuable jobs performed by independent distributors of Armco Steels across the country. Even more important, they feed steel to the many thousands of small manufacturers so necessary to the healthy growth of the American economy. Big companies benefit, too, from prompt, efficient warehouse service.

Free Storage Space

By serving as rent-free stockrooms for manufacturers, independent suppliers of Armco Steels free storage space and inventory capital for profitable investment in new equipment. Since they supply steel "custom-tailored" for each buyer, scrap losses are cut down too.

Simplify Buying

Armco Distributors' great variety of stocks makes them shopping centers of industry—helps eliminate complicated and costly many-source buying. They carry complete stocks for their customers of one or more of these Armco Special Purpose Steels:

Stainless steels, Armco ZINCGRIP® and ZINCGRIP PAINTGRIP® Steels, Armco Enameling Iron, Cold Rolled PAINTGRIP, Welded Steel Tubing, Magnetic Ingot Iron and Electrical Steels.

By making these and other basic steels and steel products readily available, Armco Distributors from coast to coast help keep industry supplied and paychecks full. Make it a point to become acquainted with the independent Armco Distributor in *your* community.

ARMCO STEEL CORPORATION

2256 CURTIS STREET, MIDDLETOWN, OHIO

SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Story of a Growth Industry

It has become popular to talk about glamour industries with tremendous growth potential. If that is what you are looking for, why go beyond Metalworking?

Metalworking is not a "Johnny-Come-Lately" to the ranks of growth industries, as some others have been. Its record over the past decade is eloquent testimony to that fact.

In 1946, the first full year after World War II, the value of products manufactured in the metalworking industries amounted to $36.4 billion. Ten years later, during the current year, Metalworking's output is estimated at $119 billion. That is a walloping increase of 230%.

If you take manhours . . .

instead of dollars worked as a measure, look at the steep climb of the American Machinist Index of Metalworking Production (with 1947-1949 taken as 100). In January 1946 this index stood at 85. Today it is at 171. This means that metalworking operations now are double those of ten years ago. This expansion in manufacture of metal goods has been accomplished, incidentally, with an increase in workers of only 29%. Greater production per manhour, thanks to mechanization, did the trick.

Industry as a whole has not fared nearly as well as Metalworking. The Federal Reserve Board's Index of Industrial Production went up only 69% in the 1946-1956 period—from 85 to 144. To put it another way, Metalworking has expanded its physical volume of production far more than the national economy since the end of the war.

Suppose that we look . . .

at some more revealing figures. In 1947 Metalworking contained 17,504 manufacturing plants. By 1953 the number of plants had grown to 27,496. The increase was 9992 or 57% (comparative statistics for 1946 and 1956 are not available).

Scan the figures on capital expenditures in Metalworking ten years ago and now. And remember that about three-fourths of such expenditures go for new production equipment and only one-fourth for building. Capital outlay in 1947 added up to $1.5 billion. By 1956 it had risen to $5.1 billion, or more than three times the 1947 dollar volume.

"Great! Very impressive!" you say, "But what's going to happen from here on?"

One thing you can count on, as you look ahead, is that Metalworking, which omprises some 35% of all manufacturing industry, is not through growing. The next five to ten years will see tremendous expansion in almost all of Metalworking's segments.

Preliminary plans for capital spending, reported to the McGraw-Hill Department of Economics, confirm this prediction. In the three years immediately ahead—1957, 1958 and 1959—the outlay in Metalworking will be at least $11.3 billion. Actual spending is much more likely to be above that figure than below it.

Growth in Metalworking's volume . . .

of business is conservatively put at 20% between now and 1960. It is reasonable to expect a further 20% expansion by 1965.

The *American Machinist* Index, on that basis, should be at about 205 four years from now, compared with 171 today. In 1965, it should be at 240, or higher. Translated into 1956 dollars, Metalworking's volume should soar from $119 billion of goods this year to $143 billion in 1960, to $171 billion in 1965.

What a breath-taking opportunity confronts manufacturers in the metalworking industries—builders of production equipment, makers of materials, fabricators of parts and producers of end products. No alert management, as it plans for the next five to ten years, should fail to take into account this impressive story of a growth industry that will continue to grow and then mold its own program of operations around this solid fact.

Burnham Finney EDITOR

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United Steel Fabricators, Inc. are pleased with the accuracy in forming and ease and speed of operation which are important factors in this economical production.

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—Cincinnati Rigid Deep Beds and Rams

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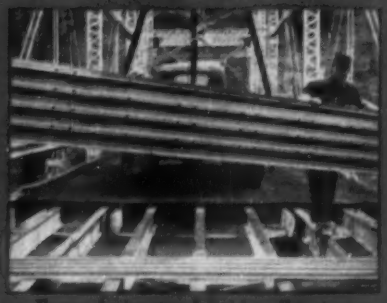
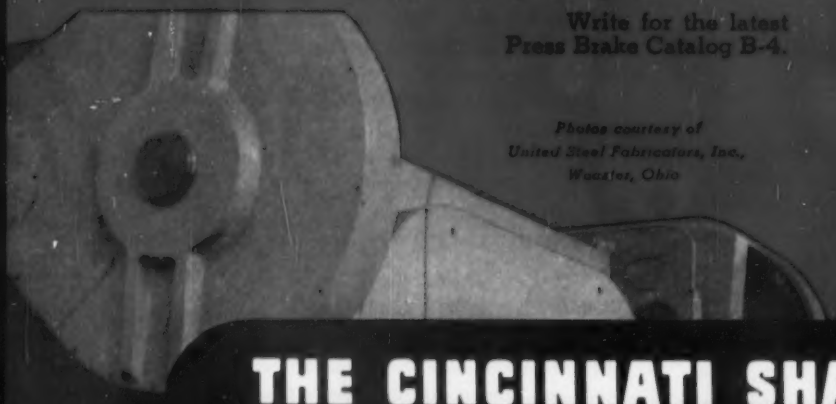
Photos courtesy of United Steel Fabricators, Inc., Wooster, Ohio



Formed structural bridge flooring

Barrier beam guard rail formed to any radius desired



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American Machinist

New techniques build '57 cars . . .

A billion dollars went for new tooling, equipment, and facilities to build the '57 models. First production of the new cars started less than a month ago, and changeovers are still in progress. Here, in the first of a series, are reports from six plants showing new processing principles, new production methods, and advanced materials handling

GEORGE H DE GROAT, associate editor

Not since 1954, when $1.1 billion was spent by the automotive industry for producing major changes in '55 models, has so much been spent for tooling and equipment to produce new cars. General Motors, for example, allocated about $400 million; Ford, around $300 million; and Chrysler, $200 million. American Motors will have spent about $40 million and Studebaker-Packard somewhere in the neighborhood of $50 million. Current plans call for 6½ to 6¾ million cars in 1957.

Although major changes will occur only in cars made by GM, Ford, and Chrysler, everyone has spent a lot of money on new production techniques and developments. Part of the reason for reaching the billion mark again is the increased cost of machines and tools. But there is also an increased trend toward automatic equipment. In this competitive field it is essential to cut costs wherever and however possible. Few machines are "standard" anymore; most of the equipment ordered is of the more expensive "special" type and has to do a particular job on a specific part. Without such equipment, cars would be priced right out of the market.

New production developments also account for a portion of the money spent, and while some of these new techniques are the result of normal progress, a lot are directly related to new features in the '57 models. The new 14-in. wheel, for example, requires new dies. There are ten die setups needed to make a wheel, five for forming wheel disks and five for combined press and roll operations in forming rims. However, not every '57 car will have the smaller wheel. Among those that will stick to the 15-in. wheel are Cadillac, Lincoln, Buick, and Continental. As a result, wheelmakers are faced with the problem of retooling to meet the needs of those that do change while continuing to maintain equipment for those not changing over.

Among other innovations, Chevrolet will have a brand new "Powerglide." Ford will come out with a convertible hardtop in addition to the new "family-size" Thunderbird and, of course, preparations are being made for the as-yet-unnamed car Ford will introduce later in 1957.

New production developments include considerable work with ceramic tools. Nearly every car builder has been running tests: some are in limited production and others have full scale setups. One master mechanic said ceramic tools "—are now about where carbides were in 1932. We know there is something good here, but we have to work with it, experiment, cut and try. In time we'll find out how to really use them, and maybe we'll be able to tell the ceramic tool manufacturers something, too." In another auto-

motive plant where 98% of the cutting tools used are carbide, ceramic tooling is now at work on a trial basis. Results look good—even on forged shafts where scale usually presents problems.

Another new development is the dynamic balancing of completed engines combined with hot testing. Ford will balance 100% of its engines this way on installations at the new Cleveland Engine Plant as well as in Detroit. Stretch forming is combined with die forming to make complex sheet metal sections in one setup at Chrysler Corp. This development cuts stamping and handling previously required. Drain trough moldings are among the parts now made this way; with further development roof panels will be possible. In addition to higher production rates, stronger sections are produced—a distinct advantage in view of the current, and growing, popularity of hard-top models.

"Side gating" is a new tooling idea that permits considerable flexibility in switching body styles on a production line. Although tool costs are high, this technique is now in use on some of GM's lines and is being set up elsewhere among the Big Three. A movable truck, with a precision-built base plate, moves around a closed-circuit production line. A floor pan is mounted on the truck's base with dowel pins at the start of the circuit—then as the truck moves along, component parts are tack welded to it. Huge jigs support the sides of the auto body in process until it builds up sufficient strength to allow transportation for final welding.

Not all the new production techniques involve mile-long transfer lines and acres of special equipment. A lot of work has been done on increasing small tool life, the redesign of dies and fixtures, experiments with new punch materials, and other important, but relatively unglamorous developments.

...at Ford engine plants...

Balance engines

First high-volume setup for balancing completed engines running at operating speed under their own power is now in operation. Combining balancing with hot testing, Ford checks the vibration level of 100% of their engines, balances those with excessive vibration to insure smooth, quiet operation of high-compression engines in addition to improved efficiency and less engine wear.

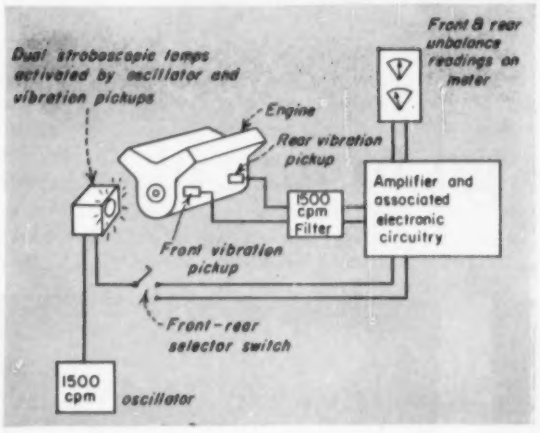
Dynamically balancing engines is not brand new —Lincoln and Mercury engines, for example, have been balanced this way since 1954 using large, stationary, electrically driven machines which required handling of all engines whether they needed balancing or not. With statistical quality control employed in balancing both rotating and reciprocating parts, the majority of the engines do not require balancing, but it has been necessary to check them all on the special machines to find out which are in tolerance and which are out. As a result, considerable time has been lost in unnecessarily handling those that are within balance tolerances.

By combining balancing with hot testing, it becomes part of the cycle, and this lost motion is eliminated. Engines that need balancing at this point are only a fraction of the total; the majority are merely checked while being hot tested and are then passed on. If the old method of balancing were used for '57 Ford engines, building extensions would be necessary to house the equipment. The new process not only saves time, but reduces floor-space requirements. Other advantages include balancing engines while they run at operational temperatures. In addition the equipment has a production capability of ¼ oz-in. with a linear response of ⅛ oz-in. throughout the range. This is especially advantageous when weight slugs are used. Finally, without external couplings to drive the engine there is no external source of unbalance added to the engines under test.

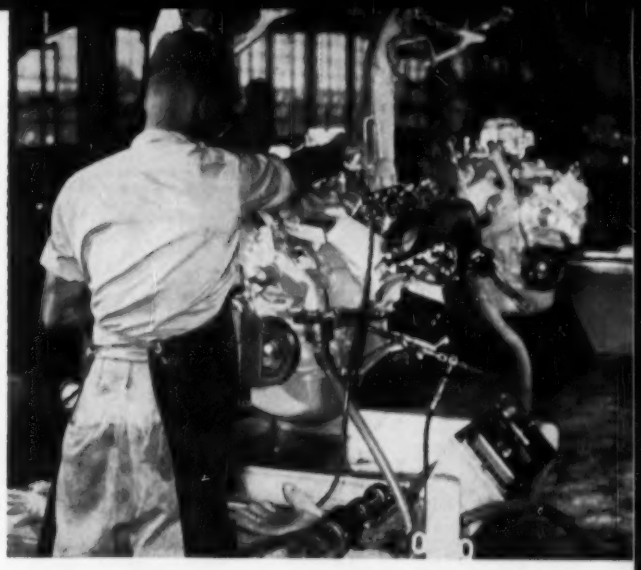
A Jervis B Webb conveyor automatically delivers engines to the hot-test area where each stand is equipped with an electronic balancer built by International Research and Development Corp. Principle components of a balancer are shown in the drawing.

The two vibration pickups are the sensing elements of vibration caused by unbalance and are mounted on an arm attached to the conveyor carrier. The pickups point radially to the front and rear correction plane of the engine simultaneously. The front correction plane is on the V-belt pulley and the rear correction plane is on the flywheel. Alternating currents generated by the pickups respond to the mechanical motion of the engine and are proportional to the vibration amplitude and speed of the engine. The phase of the electrical output bears an established relationship to the physical location of unbalance. Because all engines are balanced at 1500 rpm, output of the pickups after amplification and integration is directly proportional to the ounce-inches of unbalance at each end of the engine.

The output of the pickups is fed to the console which houses the electronic brain of the system. In addition to the dual-channel circuitry ror simultaneous treatment of signals from both front and



Two vibration pickups . . .
(front and rear of engine) are included in balancer. Electronic circuits with filters and associated elements are wired as shown above. Stroboscopic light indicates both engine speed and *location* of unbalance while meters record *amount* of unbalance



Strob light . . .
directed at front pulley is watched while throttle is adjusted to 1500 rpm. Then unit is switched to fire two lights, one actuated by oscillator and one by vibration pickup. When marks produced by the two lights are superimposed, the mark shows the angular position at which weights are to be added

while hot testing on conveyors

rear pickups, the console contains a dual calibration system controlled by one master selector switch to accommodate different types of engines. Each electronic channel contains filters, amplifiers, integrating circuits, and plane separation networks. The purpose of the filters is to reject all unwanted vibration signals: explosion pulses, reciprocating pulses, vibration from outside the engine, etc, except vibrations resulting from the engine's rotational speed of 1500 rpm. The plane separation network eliminates the effect of unbalance at one end of the engine upon the reading at the opposite end.

Signals from the console are fed to two meters mounted above each test stand. Each meter simultaneously presents the amount of unbalance at the front and rear of the engine. In addition to direct calibration in ounce-inches, each meter is graduated into four major divisions: green to indicate the acceptance tolerance and yellow, orange, and red, to indicate the size weight to be added. Readings are held on both meters until the balancing operation is completed, then they reset to zero automatically. Thus the operator can see immediately if the engine is in balance, or which end of the engine is out of balance and how much.

Other signals to indicate engine speed and the position of unbalance at the front and rear of the engine are fed from the console to a stroboscopic unit mounted by the front engine pulley. This unit contains two stroboscopic lights, one triggered by a 1500 cpm oscillator and the other by each vibration unbalance sensed by the pickup.

When engine speed is throttled to 1500 rpm, the front pulley appears "stopped" when viewed under the stroboscopic light. In this manner the operator sets the engine at the desired speed for balancing. The second stroboscopic light is engaged to observe the position of a chalk mark previously placed on the front pulley. The chalk mark position shows the location of unbalance at the front and rear of the engine independently by means of a two-position switch on the stroboscopic unit.

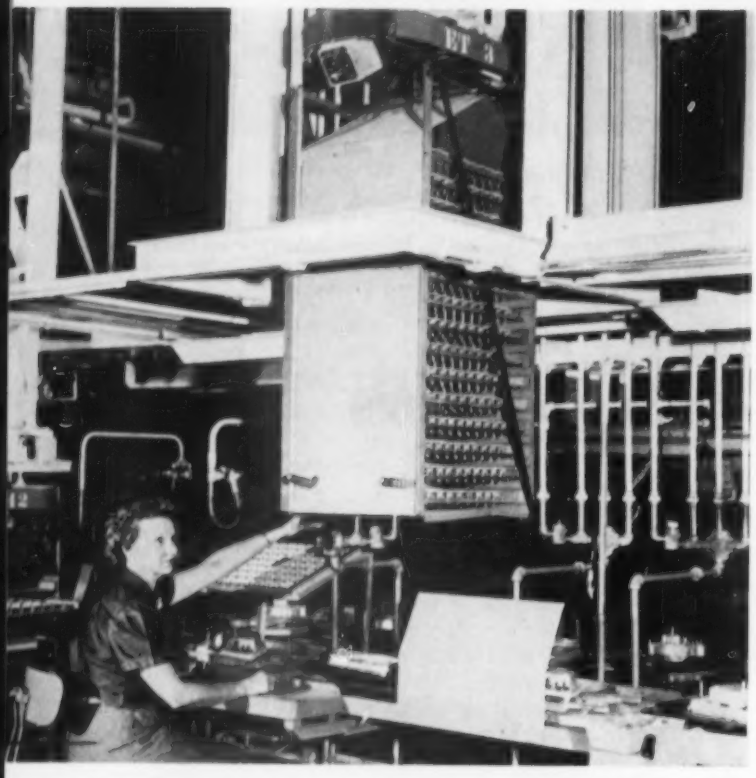
A reference mark is placed on the accessory sheave before the engine enters the hot-test area. After an engine has been connected on the hot-test stand, the operator attaches the support arm containing the pickups to the conveyor carrier and the engine is throttled to 1500 rpm as indicated by the stroboscopic light. The operator then reads the meter, and if the unbalance does not exceed tolerance, no further work is requred. If the unbalance does exceed tolerance at either the front, rear, or both, he engages the first light in the stroboscopic unit to observe the position of unbalance at the front and rear. This is done by observing the position of the chalk mark on the front pulley as viewed under the stroboscopic light triggered first by the front pickup and then the rear pickup.

The engine is stopped and rotated manually to position the chalk mark at the location observed under the stroboscopic light while the engine was running. An air tool is then employed to drive a weight of proper size into pre-drilled holes in the flywheel or the front pulley.

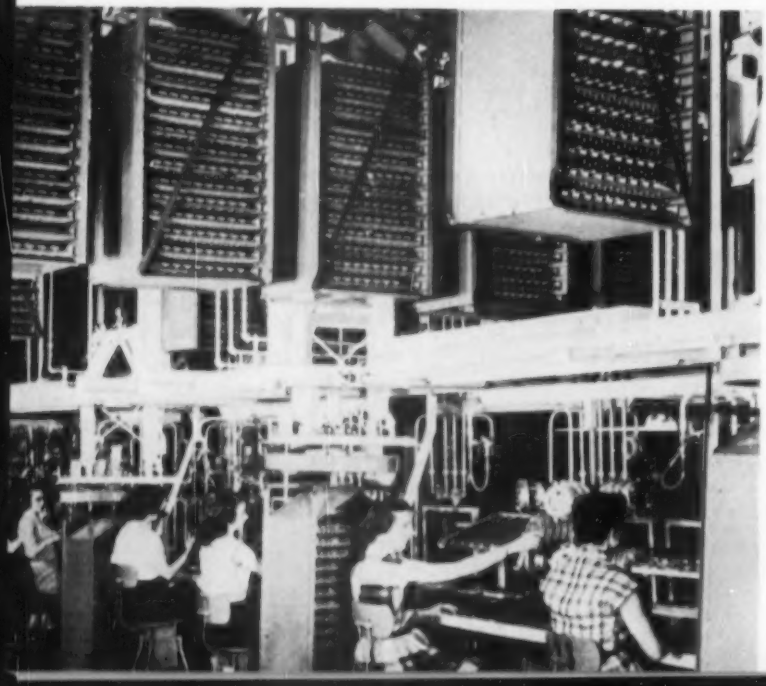
New techniques build '57 cars...

...at AC Spark Plug...

Overhead carriers go to any of 47 destinations



Overhead conveyor . . .
for carrying production parts to assembly areas has parts carriers controlled by master selector switch, the setting of which determines the carrier's destination. In the subassembly area of AC's instrument department, speedometers, oil gages, gas gages, ammeters, and transmission indicators are assembled and placed on carriers. By setting a selector switch, each carrier can be dispatched to any one of 47 final assembly stations where it is lowered from the conveyor rail to bench level



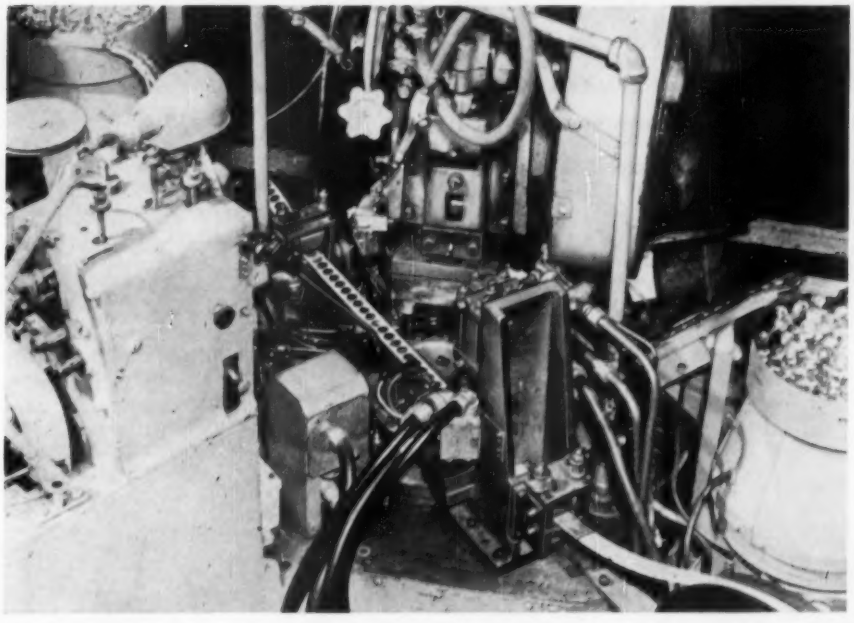
Power and free principle . . .
is applied to this conveyor system. Power is supplied to the carrier only when it is on the main line of the conveyor; eleven free side tracks are available to hold the carrier above a work station until it is needed

Progressive mechanization eliminates monotonous, repetitive operations previously handled manually. Extensive use is made of overhead conveyors to shuttle sub-assemblies to assembly areas, for example. This is a departure from conventional materials handling in that production parts are moved along the ceiling rather than across the floor. Result is reduced production and storage costs, better use of existing floor space, and minimized safety hazards.

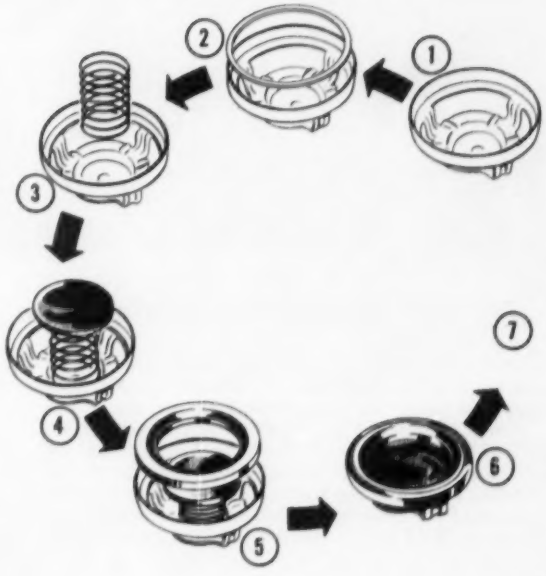
Another example of progressive mechanization applied to AC's assembly line is a rotary machine that performs seven operations on a fuel-pump valve cage. One man sets the machine up and then operates it.

Like other advanced machines at AC this one was designed and developed by company engineers. One of their most outstanding developments is a straight-line spark plug shell and wire machine that eliminates four separate hand-fed machines previously required to perform six operations. These operations were burr ID, weld side electrode, ream ID, form center wire, and chamfer the OD.

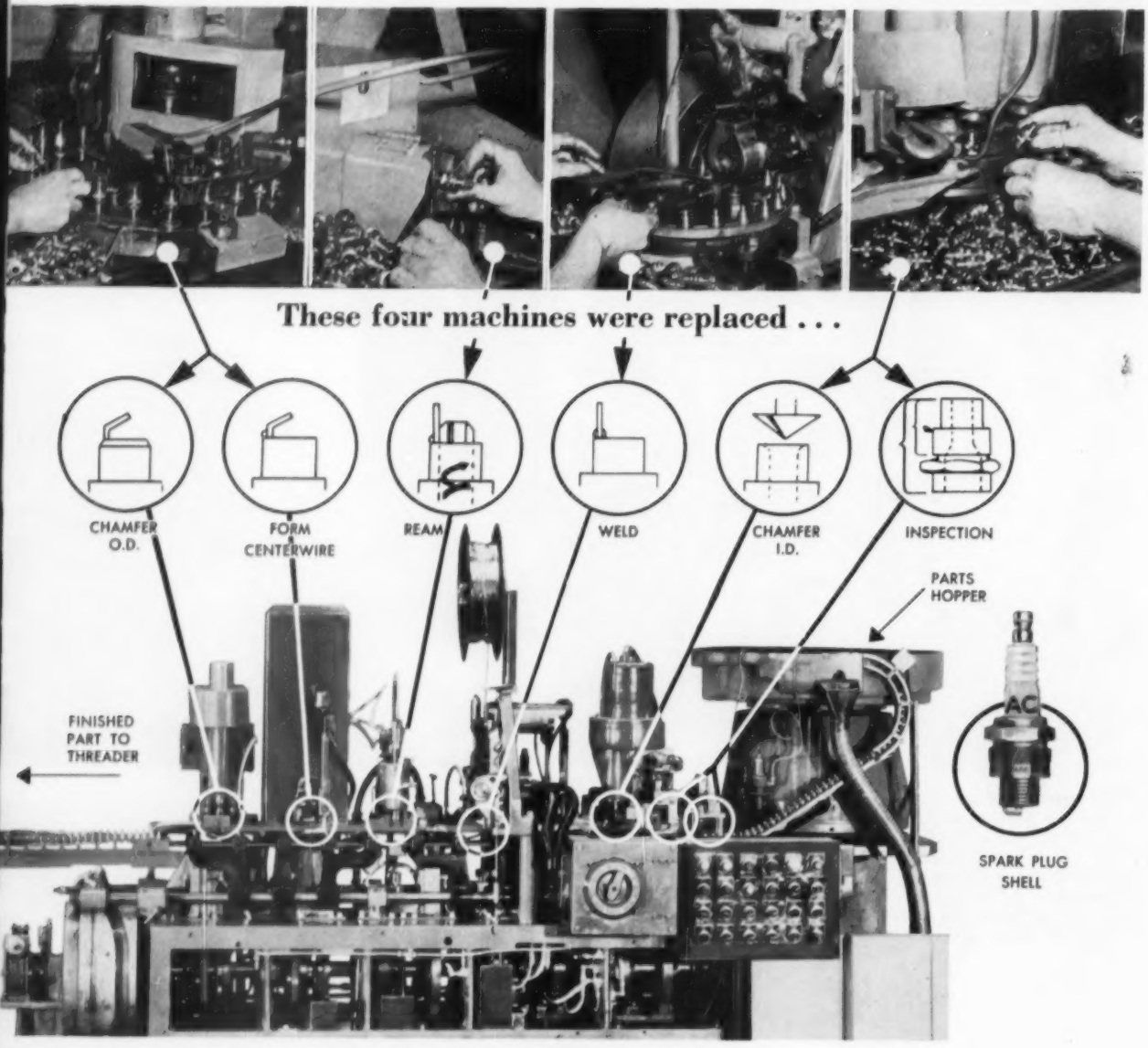
Automatic assembly for valve cages



One operator . . .
handles this rotary assembly machine for fuel pump valve cages. At the station 1, valve cages are hopper fed to nests in the table. A paper gasket is blanked and loaded into the cage at station 2, then a spring is made and loaded at the station 3. At stations 4 and 5 a Celeron valve and a valve seat are hopper fed to the valve cage, then the cage is crimped. Final station 7 tests the valve for travel



...at AC spark plug...



. . . by one straight-line machine

Multiple operations are performed . . . on spark plugs in this straight-line shell and wire setup. A transfer mechanism moves the shells through various stations. At each station, cam-operated guideposts raise the work to the height needed for the operation. Shells are hopper loaded (at right) and then inspected for dimensional accuracy in the first two stations. Third operation removes the cut-off burr by chamfering the shell ID. Next the side wire is welded in place and cut to length. Weld flash is removed from the inside edge by reaming at station five, after which the side wire is formed. At station six the outside cut-off burr and weld flash are removed by chamfering. The four machines shown at top of page were eliminated by progressive mechanization in this straight-line machine. By relieving monotonous and repetitive operations such as these, automatic equipment increases quality and production rates, eliminates fatigue, and is considerably safer than manual setups

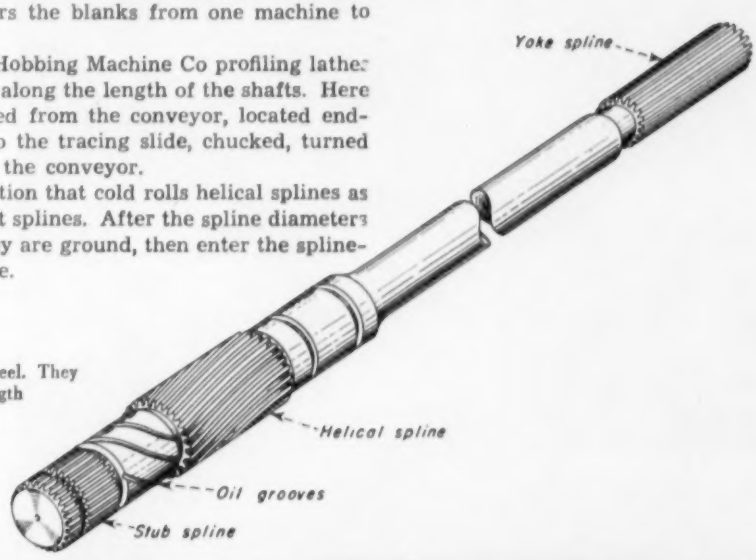
. . . at Ford's standard transmission and radiator plant . . .

Positive rakes turn alloy steel at 900 sfpm

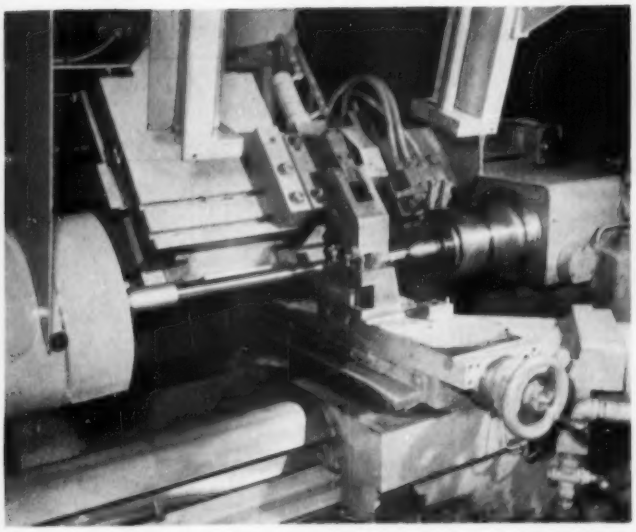
Automatic equipment jumps production of transmission output shafts. After shafts are milled and centered in a Motch & Merryweather machine, an overhead conveyor delivers the blanks from one machine to another in the line.

Four newly developed Cleveland Hobbing Machine Co profiling lathes are used for turning numerous steps along the length of the shafts. Here the shafts are automatically removed from the conveyor, located endwise in the workheads in relation to the tracing slide, chucked, turned to size, unchucked, and returned to the conveyor.

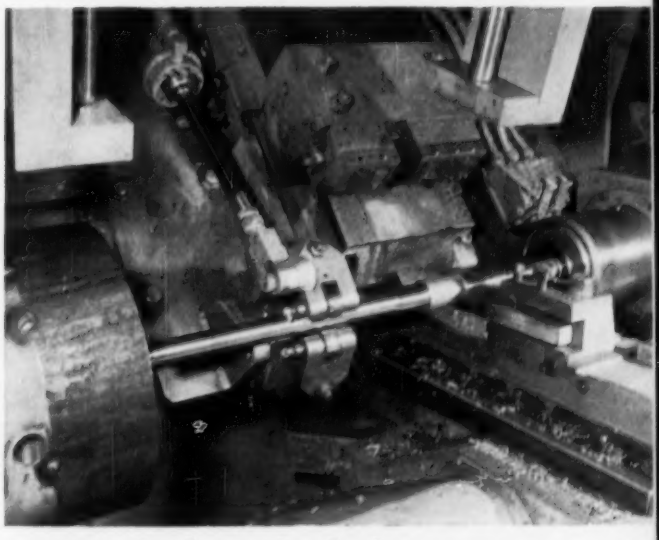
The line includes a special installation that cold rolls helical splines as well as spiral oil grooves and straight splines. After the spline diameters are turned in the profiling lathes, they are ground, then enter the spline-rolling line shown on the next page.



Output shafts . . .
are made from hot forged blanks, SAE 4024 steel. They are about 1 9/64-in. dia and 20 7/16-in. length



Carbide tools . . .
with 10° positive rake angles eliminate pressure on slender shafts and provide fair tool life. Lathes run at 2400 rpm to provide 900 sfpm cutting speed. About 2 lb of stock is removed in 30 sec, with chips removed automatically by built-in conveyors. Two of the templet-controlled lathes contour turn steps at the yoke end as shown here



Automatic loaders and unloaders . . .
are synchronized to handle work while the machines are starting and stopping. Overhead conveyors move the shafts from machine to machine in the automatic line. The second two lathes turn the oil grooves and spline diameters

New techniques build '57 cars...

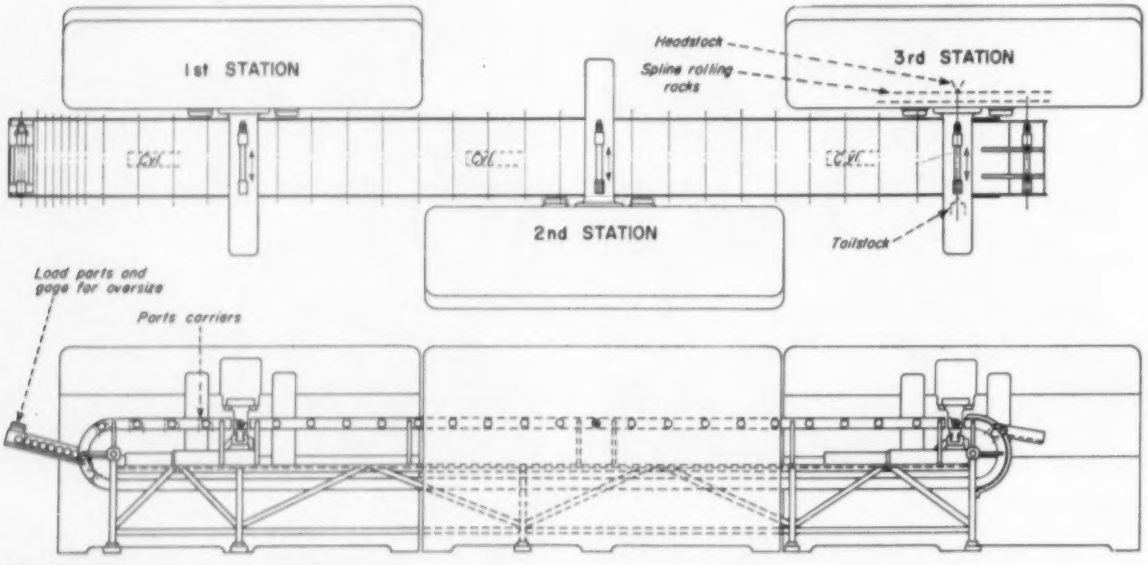
...at Ford...Cold rolling is chipless way to

In Ford's spline-rolling line, accumulated tooth spacing is held to 0.0015 in., PD runout is held within 0.0015 in., and involute form within 0.001 in. All parts must pass composite PD and OD ring gages as well as mounting concentricity bushings.

To maintain concentricity tolerances, all machines must be level and properly aligned. This is accomplished by mounting them on concrete with six rubber-mounted leveling jacks under each one. Elevation of parts to the center of the rolling racks is held between 0.005 and 0.010 in. vertically.

After spline rolling, the shafts are delivered to a Sundstrand lathe for qualifying the snap ring groove to length, diameter, and width. Drilling a 0.257-in.-dia hole to retain a speedometer drive gear follows, after which the shafts are carburized and hardened to a case depth of 0.040 to 0.050 in. at 57 to 63 R_c.

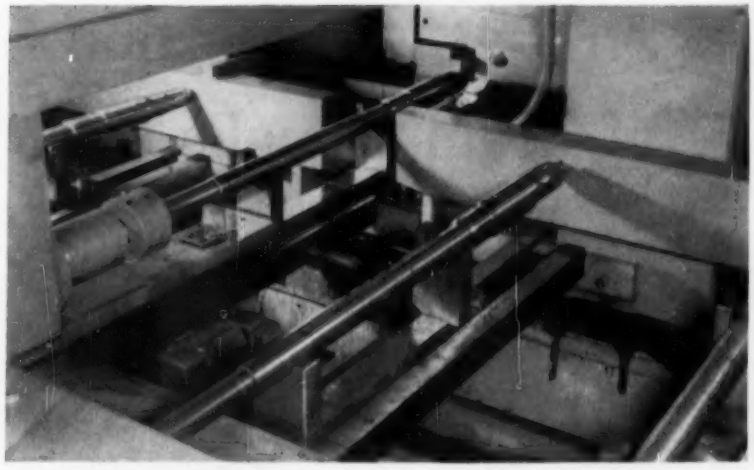
Three spline rollers . . .
Michigan Tool Co Roto-Flo machines, are installed in line with a "Gearmation" transfer conveyor for automatic work handling. Work is loaded automatically into 52 fixtures on this conveyor. Machine operation is simultaneous and synchronized with indexing so transfer occurs after shafts have been withdrawn from each machine



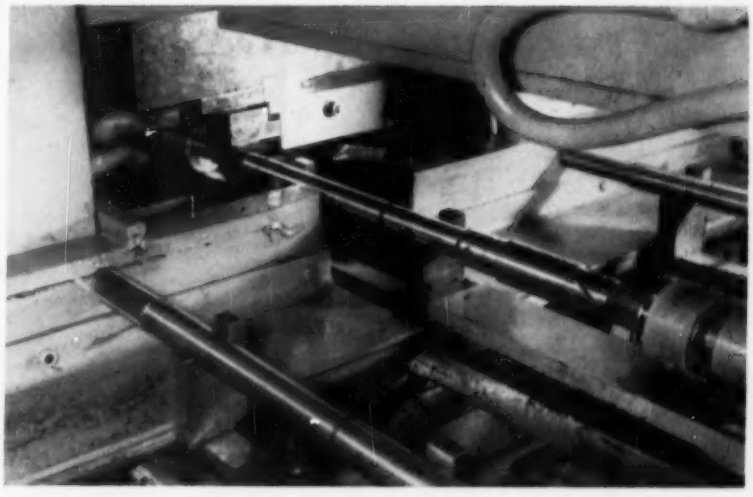
Shafts first enter a templet gage . . .
that accepts or rejects them on the basis of diametral tolerances. (Shafts must be ground within tolerance because roll forming cannot correct errors.) Three air cylinders index the conveyor every 17 sec, align it by location stops at each machine. Limit switches actuating air cylinders are interlocked with machine circuit to prevent operation if work is not aligned

get oil grooves and splines

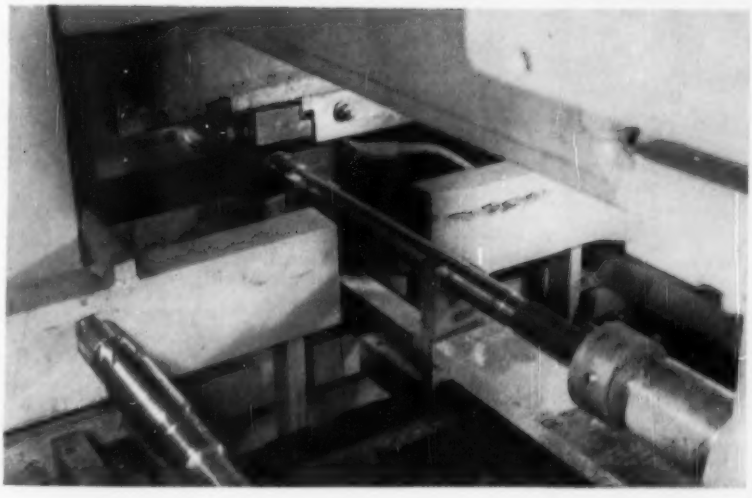
1st Station:
Six right-hand-spiral oil grooves and a 32-tooth stub spline are rolled in a dual set of racks. Shaft is loaded between centers by advance of tailstock that pushes the part and carrier into tooling area. Rolling racks advance and roll splines, then tailstock returns with part and carrier for transfer to next station



2nd Station:
A straight 28-tooth yoke spline is rolled at the other end of the shaft. Blank diameters are below required PD and OD—metal displacement produces required dimensions. Tapered wedge permits size adjustment of the tapered rolling racks. Maximum adjustment is 0.0015 in. before changes affect tooth spacing and form

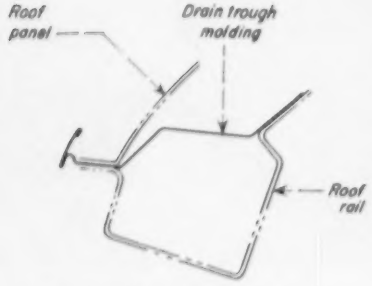


3rd Station:
An involute helical sliding gear spline is rolled. Silicone-base coolant, Roto-Lube, is used. Each machine can be run individually and manually as well as automatically. To put in new racks, set up, clean, and establish new sizes takes about 2 hr. Control panel at any station will stop any other station in line



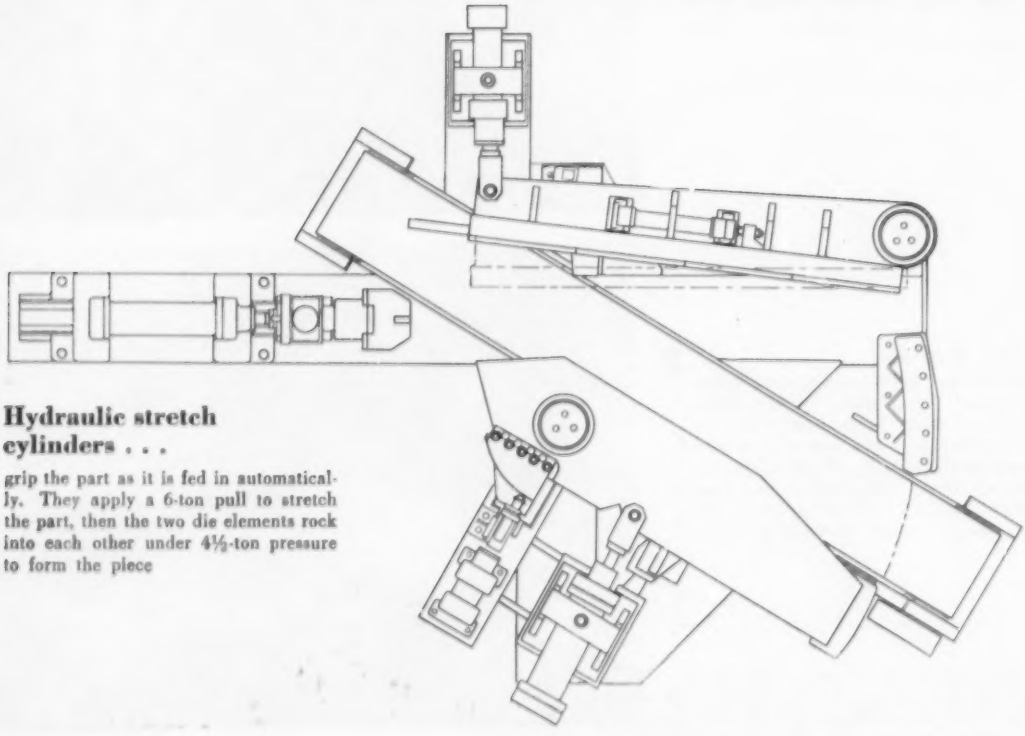
at Chrysler...

Stretch-wrap forming of drain troughs



Complicated cross-section . . . of this drain-trough molding is produced by combination of stretch-wrap forming with die forming. This combination eliminates several stamping operations and reduces handling

Radial-draw forming machines... produce stronger sections by the stretching and planishing action than was possible with conventional methods. Production is 300 to 400 pieces per hour



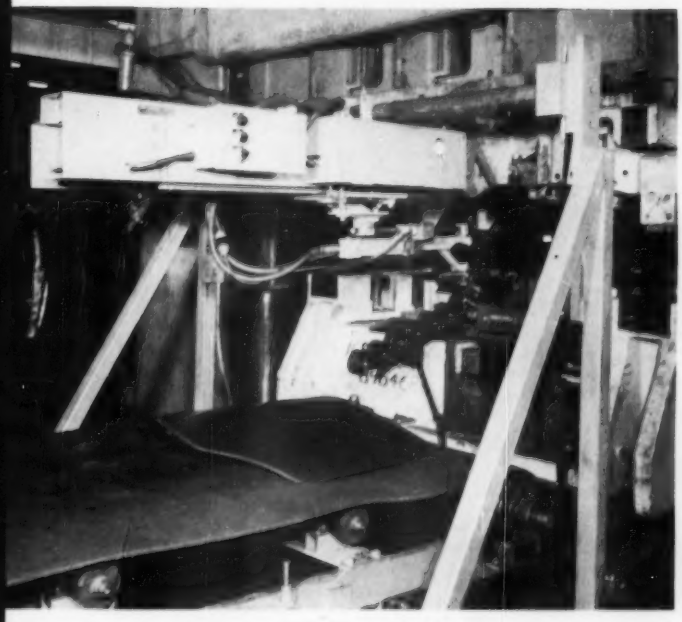
Hydraulic stretch cylinders . . . grip the part as it is fed in automatically. They apply a 6-ton pull to stretch the part, then the two die elements rock into each other under 4½-ton pressure to form the piece

First automotive application of stretch-wrap forming combined with die forming is in operation. Long familiar to the aircraft industry, this technique is now applied to the production of drain-trough moldings for Plymouth, Dodge, DeSoto, and Chrysler cars. Four radial-draw forming machines developed by Chrysler and built by Cyril Bath Co are employed at Eight Mile Road Plant in Detroit.

These radial-draw forming machines operate at high speed to produce 300 to 400 pieces per hour—an increase of 200% over previous methods of making drain-trough moldings. The part is automatically fed into the machine where the ends are held in gripper heads connected to hydraulic stretch cylinders. A pull of about 6 tons is exerted to stretch the part so that the metal becomes plastic and flows. Two die elements are then rocked into each other under 4½-ton pressure, forming the piece a bit at a time. The formed part is then automatically unloaded and the cycle starts again.

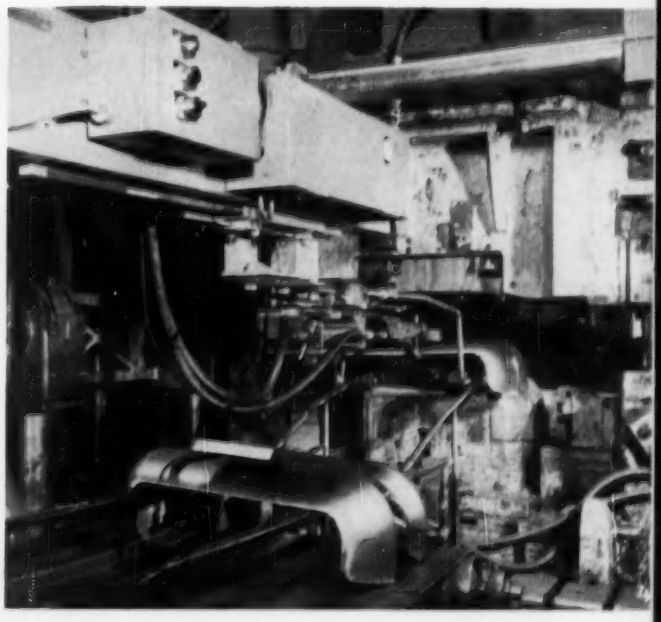
Speed of operation is not the only reason for going to stretch forming at Chrysler. Modern cars must be strengthened where they have become relatively weak by the advent of hardtops and the wrap-around windshields. Making the drain-trough molding a structural part of the car body makes new construction essential. The resulting complicated piece cannot be made practically with bending machines or in conventional stamping presses where the operations would be expensive and inaccurate. With the trend towards fewer roof supports in all types of cars, the increased strength obtained by stretch forming (where the granular structure of metal is elongated and ironed together in a new shape) is a

Press unloaders go portable



Portable automatic press unloader . . .

places door panels on a belt conveyor for transfer to another press operation. This new equipment, built by Press Automation Systems, Inc, Detroit, can be moved from one press to another —is completely self-contained. Plug-in connections to air and 110-v electrical outlets put it in operation and it runs on 50 psi air pressure. In operation, the jaws advance into the die area and grip the panel. The carriage then moves to the rear, where the jaws open and retract dropping the panel on the conveyor. Advance of the carriage starts a new unloading cycle



Safety and high production rates . . .

are combined with automatic press unloading equipment. Here, a PAS unloader removes a seat side panel from a die and drops it on a conveyor equipped with guide rails that prevent entangling. The unloader can be operated manually as well as automatically—has a single-stroke push button to facilitate die setup

distinct advantage added to the producibility factor.

Various types of press automation are also in use at Chrysler's Nine Mile Press Plant to increase safety as well as to provide high production rates in making center and hinge pillars, seat side panels, and other passenger car stampings.

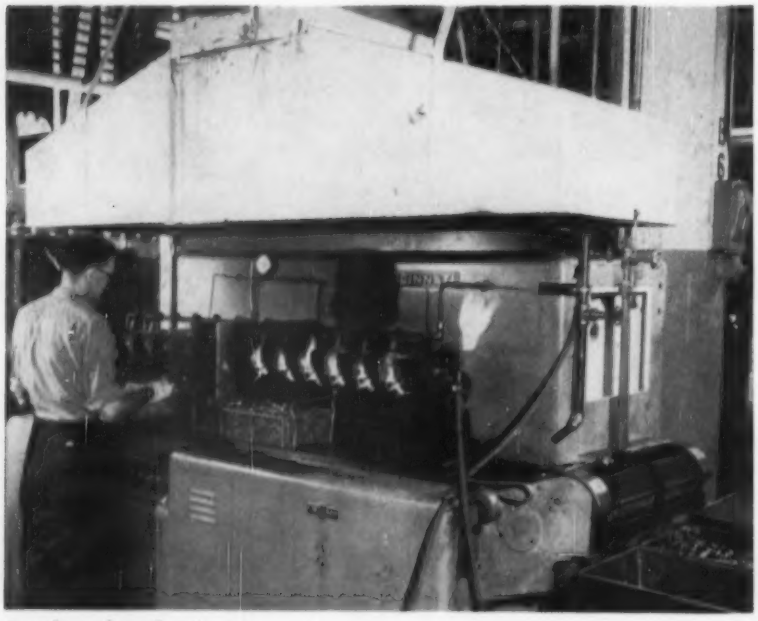
New flame hardening applications

New heat treating equipment includes Cincinnati "Flamatic" machines with dual fixtures for hardening cup and pad surfaces of intakes and exhaust valve rocker arms. The operation consists of alternately loading six valve rockers in each side of the dual fixture. One side of the fixture is tooled for exhaust-valve rockers, the other side for intake valve rockers. While one group of parts is heated, the other side is being loaded.

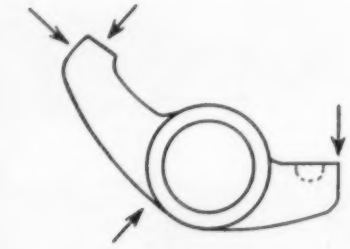
Modified at the Dodge Main Plant for greater flexibility and higher production rates, each of these machines replaces three induction hardening units previously used. Added flexibility permits hardening both mechanical and hydraulically lifted rocker arms, (used in different V-8 engines) with different areas to be heated. Circuits that control multiple-head torches can be energized separately for various types of work.

Cycling is automatic. Air-electric solenoids control clamping and release of parts in each fixture; timers and relays control flow of water for cooling burner heads, flow of gas to burners, and rate of travel of a conveyor through an oil quench tank. A heat exchanger maintains oil temperature at 145 F in accordance with metallurgical lab specifications. Fuel is natural gas and oxygen in proportions of 5 to 1. Natural gas at 1½ psi is raised to 14 in the main line and delivered to the heads at 7 psi. Liquid oxygen, converted to gas, enters the main line at 70 psi, then is valved to the heads at 35 psi. Fuel consumption runs about 0.5 cu ft of natural gas and 0.88 cu ft of oxygen per piece.

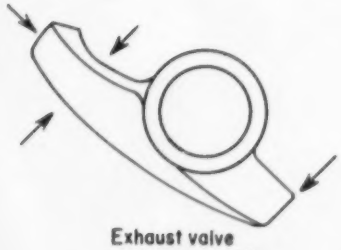
Flame hardening is selective



Surface hardening . . .
various areas of intake- and exhaust-valve rocker arms is handled at a rate of 400 of each kind per hour in this Cincinnati machine. Automatic cycling provides a 22.8 sec heating cycle at six heads in one fixture while a second fixture is being loaded. After heating, parts are automatically released—to fall into an oil bath quench on a mesh belt conveyor timed to carry them out of the tank in 1½ min.



Intake valve rocker arms (6)



Exhaust valve rocker arms (6)

Multiple torches . . .
heat only those areas to be hardened on rocker arms at Dodge Main. Minimum depth of case produced is 0.030 in. and hardness at pads is 56 to 62 R_c; at cup ends it is 52 to 59 R_c. Alternate operation of dual setup—in sequence—is automatic except for manually loading the work and depressing the cycle button. Arrows indicate number and arrangement of flame burners for both types of rocker arms

. . . *at Pontiac* . . .

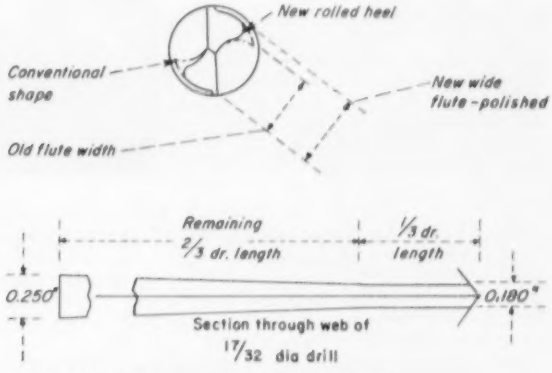
Modified design increases drill life 30 times

Two new flow-coat paint systems are now in operation at Pontiac for preparing sheet metal parts for finish coats of lacquer. Previously sheet metal sections were dipped in a huge tank of prime paint. With the new technique no dangerous open tanks of paint are used. Parts are automatically carried on conveyors through a paint section where a uniform coat of paint is applied by 80 spray nozzles.

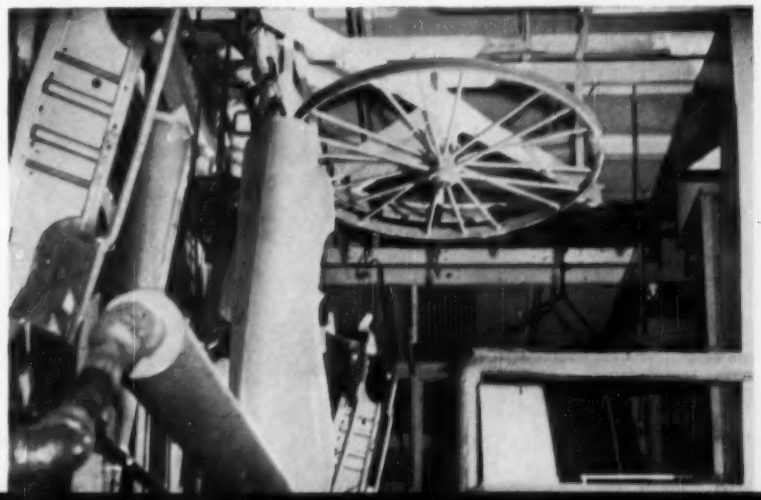
Painted sheets pass through a drip area to ovens where they are baked at 390 F for 40 min. Fire protection is provided by a system of smothering the entire area with carbon dioxide within seconds of the start of a fire.

In addition to large installations such as this, and special machines, Pontiac has done considerable research in connection with small tools. Notable success has been achieved, for example, in increasing the life of drills used on automated transfer lines for drilling deep gallery holes in engine blocks.

New drill design . . .
improves life of tools for long gallery holes in cast-iron engine blocks. Previously, conventional HSS drills lasted for 200 holes between grinds. Modified drills run more than 6000 without attention. Heavy feeds employed in drilling these deep holes produced clogged chips in flutes (left), generating so much heat that drills burned with chips welding to flutes (center). New design (right), has widened and highly polished flutes with the heel rolled over plus a helix angle increased from about 20° to 32°



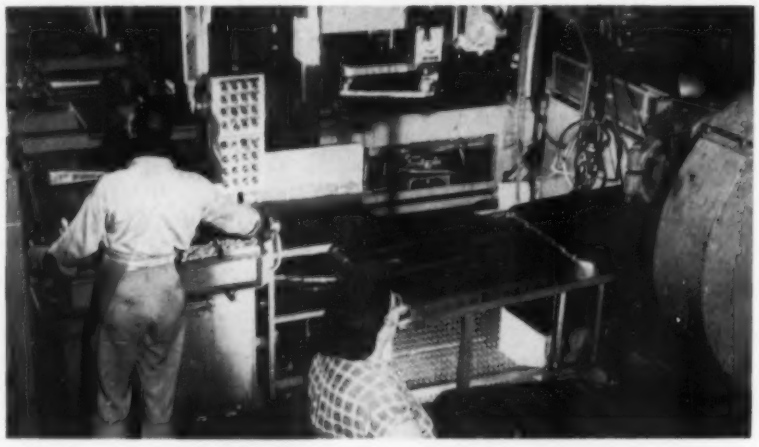
Web thickness of modified drill . . .
is changed, too. Thickness is parallel for first third of drill length, as for medium duty drills, then tapered for progressively greater thickness as in the construction of heavy-duty drills. Increased flute width is about 1/16 in. for 17/32 in.-dia drill, proportionately greater for other sizes to provide for greatest possible volume of chips. These tools run from 11 in. to 18¾ in. long, are run dry and remain relatively cool



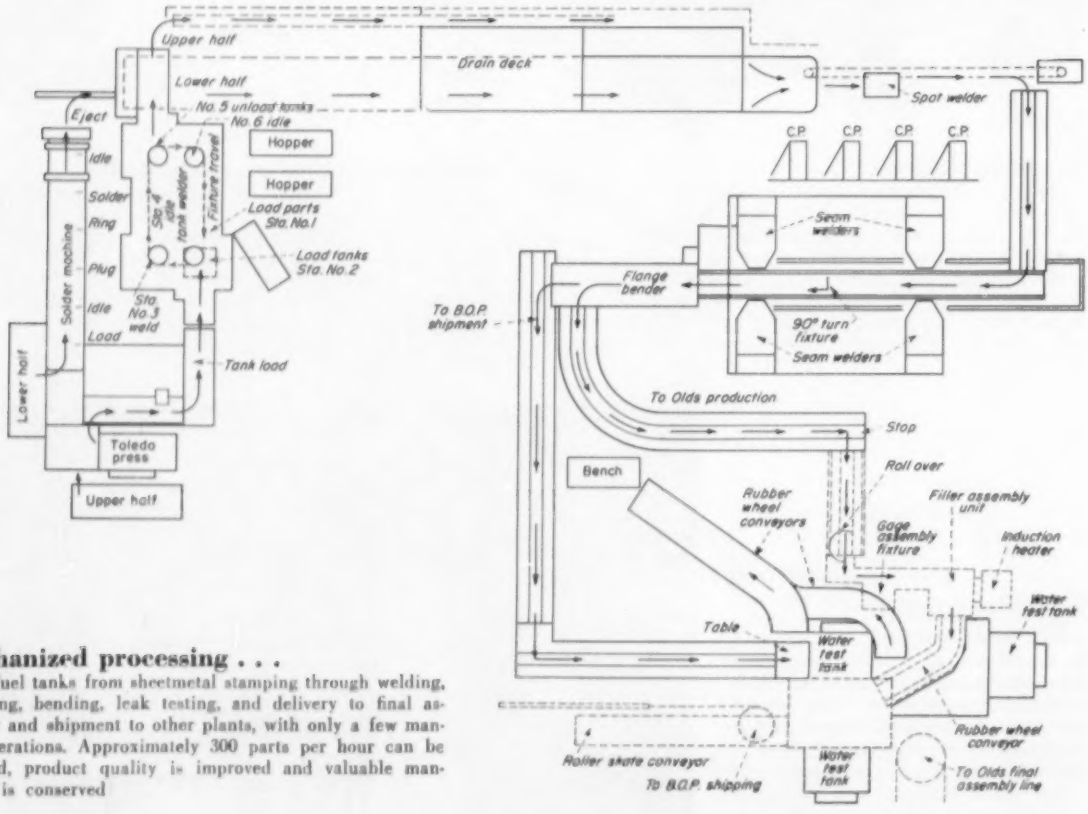
Conveyors deliver white sections . . .
to the "Flow-coat" painting system in which fixed spray guns replace the dipping of sheet-metal parts. New system provides more even application of paint, higher production rates, and safer working conditions

. . . at Oldsmobile . . .

Mechanized setups extended to welding and soldering



Material handling . . .
is minimized by locating a press adjacent to special welding and soldering setups where components are joined to stamped fuel-tank halves. Upper halves are loaded directly from the press into a Kirkhof welding setup. Lower halves go into a soldering section

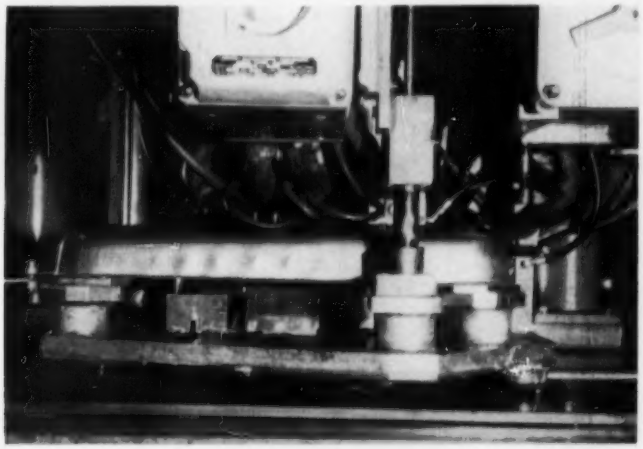


Mechanized processing . . .
takes fuel tanks from sheetmetal stamping through welding, soldering, bending, leak testing, and delivery to final assembly and shipment to other plants, with only a few manual operations. Approximately 300 parts per hour can be handled, product quality is improved and valuable manpower is conserved

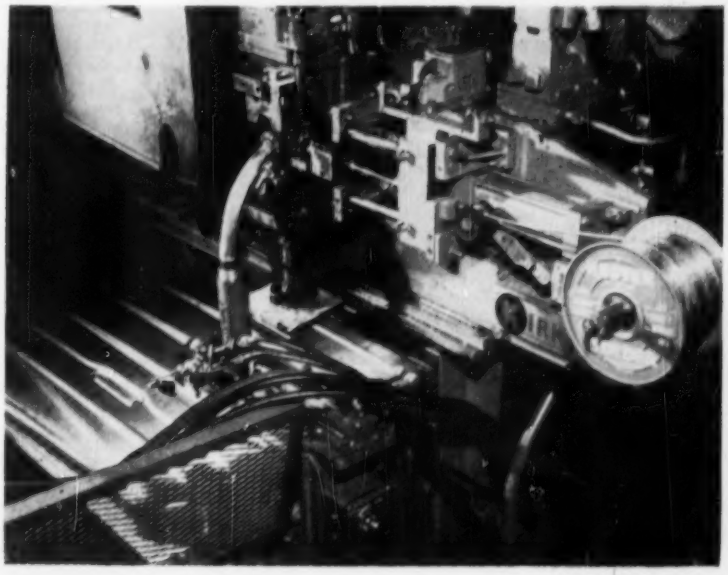
Oldsmobile has one of the first cooling systems ever to be installed in a major forging shop now in operation. Capacity of this evaporative system is rated at 500,000 cu ft of conditioned air per min. Every hot-metal worker on the press forging crankshaft line is blanketed with 5000 cfm of air moving at 3000 fpm for better working conditions.

Another new development here is a mechanized line for welding, soldering, cleaning, and bending, fuel tanks. Production rates have been doubled, bottle-neck operations are eliminated and quality of the tanks is improved.

Special pallets are employed . . . in the chain-driven welder transfer fixture where various components are welded to upper tank halves. Chain sprocket is driven by rack and pinion and a special clutch releases the pinion to permit rack return after six indexes. Lower halves are passed through several soldering stations by a transfer-bar mechanism



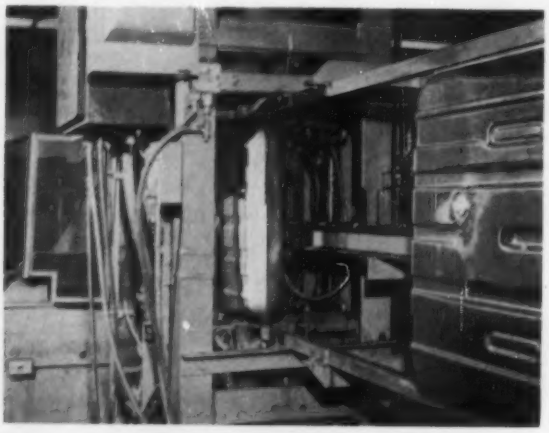
Components are welded . . . to fuel-tank upper halves at the third station of the Kirkhof welding setup. Four series welds join each of the two braces, eight series welds join reinforcements, three projection welds the gas-gage flange, and one direct weld the clip. All these welds are made simultaneously. One control handles all series welds; another takes care of direct and projection welds. Fourth and sixth stations are left idle to allow for layout and cycling needs. At the fifth station, a rack-and-pinion-actuated arm lowers three pickup fingers on each side of the part, raises it and positions it for loading into the washer loader



Lower halves . . . passing through automatic soldering sections, are fitted with drain plugs fed from a vibratory hopper. Plugs and flange assemblies are positioned by an air-cylinder-operated mechanism and are soldered in place at this station. Preformed solder rings are produced automatically in a die fed from a reel of 5/32-in. solder and are positioned over seated plugs by a pilot tube and air cylinder that slides them in place. Solder is preheated by a natural-gas flame —lowering joining time to 6 sec under a multi-head gas torch. Two water quenches cool the joint

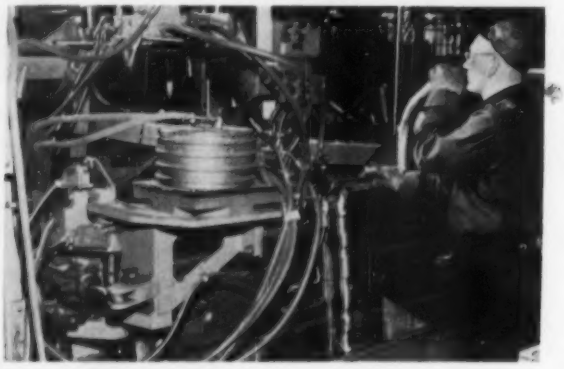
New techniques build '57 cars...

Automatic washer loader . . .
receives upper halves from welder and carries them to the washer in position for cleaning inside surfaces. Lower halves are loaded in a similar manner so inside surfaces of both halves face each other—ready for cleaning and joining. Parts are loaded only in pairs and all loading is controlled by the capacity of the International washer—about 300 pairs per hour. Flight conveyors carry work through washer for degreasing and removal of all dirt and foreign matter. Converging guide rails bring halves together and a conveyor carries them to the Taylor-Winfield tack welder



Loading of the tack welder . . .
is controlled by washer output through limit switches actuated by parts as they enter an indexing loader. The welder conveyor is stopped by a second set of limit switches when one pair of halves is in machine. Four spot welds tack halves together—two on the upper flange and two at the bottom—after which conveyors carry tanks to the first seam-welding station

Welder and conveyors . . .
are mechanically synchronized so that the seam-welding wheels actually drive the tanks when a weld is being made. Two opposed welding wheels are employed on each side. A system of limit switches controls welding current so current flows only when tanks are in place. Following the first weld, an air-cylinder-operated carrier raises and rotates the tank 90° while it is indexed forward. Another carrier then lowers it for the second weld. As it leaves welder, the assembled fuel tank is transferred to a reciprocating press loader. A special Impco air press bends flange corners down, and conveyors transfer the tanks—some to shipping areas and some to subsequent operations



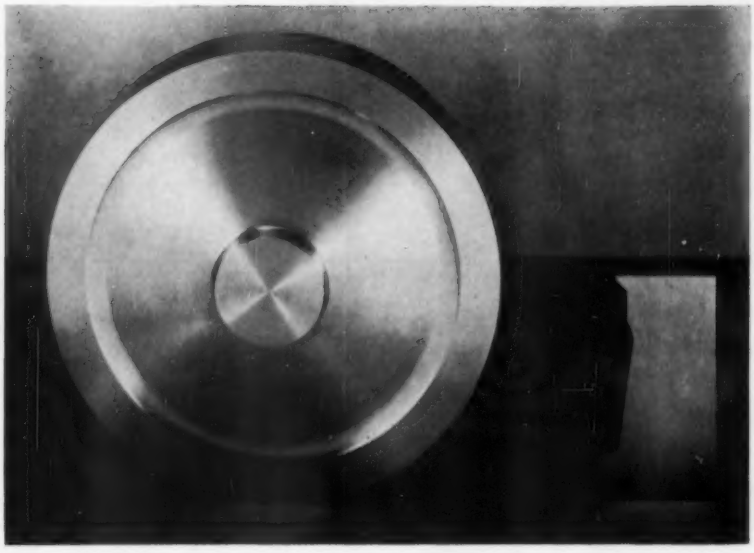
Induction soldering . . .
is semi-automatic, utilizing a 5-kw GE induction heating unit and one operator. Tanks enter a turnover fixture at end of conveyor and are manually loaded into this machine on edge—after filler necks and solder rings are placed in position. An automatic chain-driven ejector places finished tanks in an inclined roller conveyor for gravity-feed transfer to a leak test. Here 5-psi air is applied through filler neck while tank is submerged in a tank of water. Seam welds, spot welds, and soldered joints are checked for leak-indicating bubbles

Coming . . .

- **ceramic tooling**
- **contour gaging**
- **combined welding and stamping**
- **automatic assembly**
- **new way to extend die life**
- **two grinding developments**

The billion dollars spent on new tooling, equipment, and facilities this year is bringing scores of outstanding production developments. The second installment of these plant-by-plant reports, like this first one, will concentrate on the best new ideas.

New Techniques Build '57 Cars, II in American Machinist, October 22



QUALITY of the work surface is extremely important in highly stressed parts, such as this jet-engine component

How to secure desired surface finish in turning operations

Here are charts, plus finish factors for various materials, that allow you to select the speed and feed to give desired surface finish, if deflection limits of the lathe are not exceeded. You can get even better results from modern precision lathes

A B ALBRECHT, metallurgical engineer, THE MONARCH MACHINE TOOL CO, SIDNEY, OHIO

Quality of surface finish is an important requirement of many turned workpieces. This aspect of machining has received less emphasis than the quantity of material removed. Yet in many instances, the cutting speed and feed are dictated primarily by the final surface finish required. Where parts are finish turned for precision fits, for example, a good surface finish is necessary to preserve the fit.

In the case of highly stressed parts, fatigue failures are often caused by surface defects that act as stress risers where initial cracking starts. Residual stresses resulting from the machining process are another cause of fatigue failures.

In other cases, the turned parts are external elements of consumer products. Here, appearance dic-

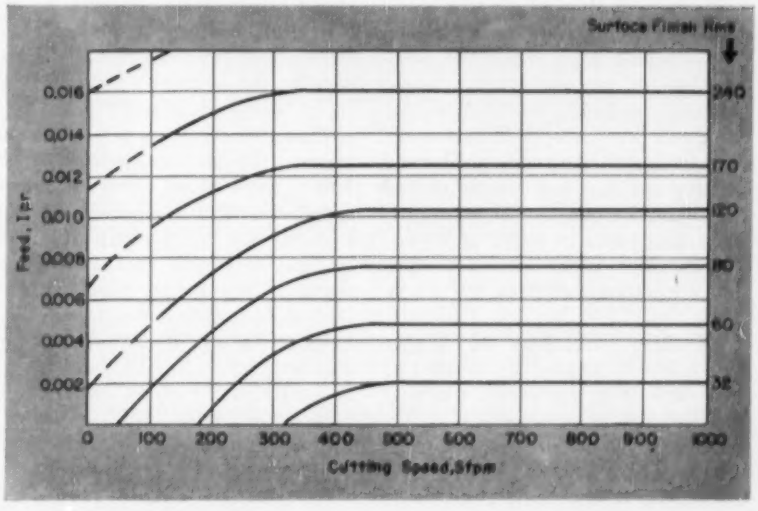


FIG. 1. . Finish vs Speed and Feed. To obtain the desired finish, select the speed and feed combination that gives the desired finish, but multiply the feed rate by the finish factor, Table 1, for the material to be cut. Tests were made on AISI 4145 steel

BASIC RELATIONSHIPS OF MACHINING FACTORS TO SURFACE FINISH

AR 20 tool, 1/32-in. radius, AISI 4145 steel

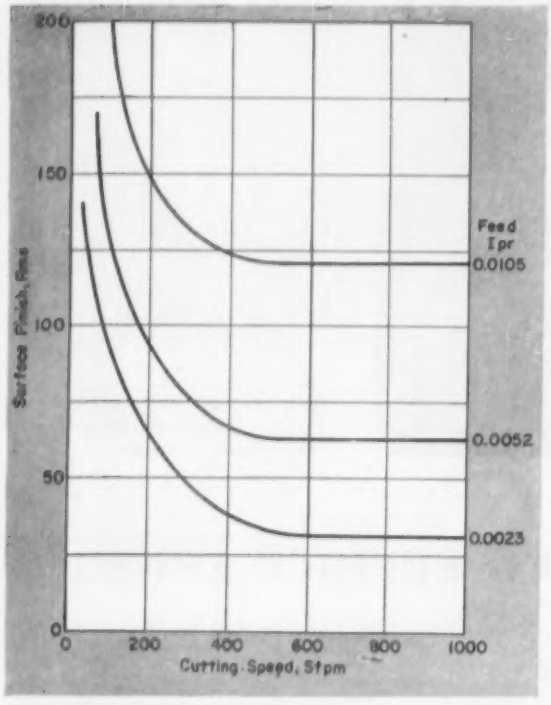


FIG. 2 . . Constant Feed vs Varying Speed. Surface quality for any feed stabilizes at 400 fpm and changes little thereafter, but surface quality is definitely related to feed rate

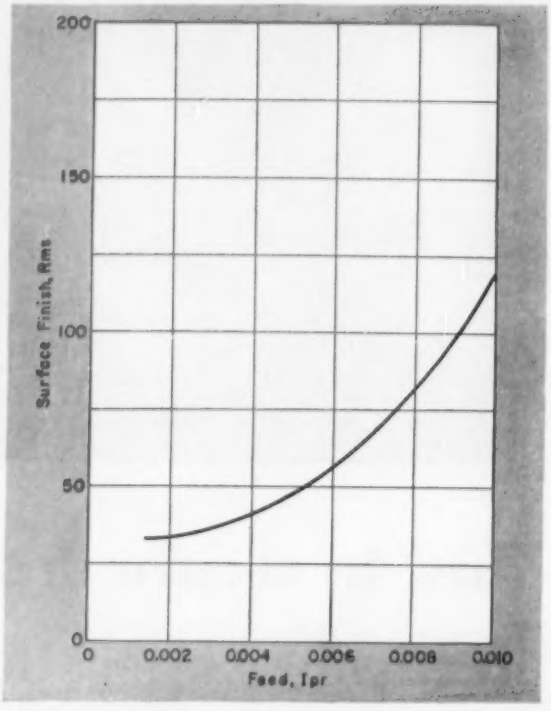


FIG. 3 . . Feed Affects Finish. At 400 fpm (the rate at which speed cancels out as a factor), the finer the feed, the better the surface quality

How to secure desired surface finish in turning operations . . .

tates good finishes. The quality of the product often is associated in the minds of the prospective purchaser with the quality of finish.

Deviations in a machined surface, which prevent it from being perfectly smooth, include roughness and waviness. The relatively fine irregularities produced by the cutting action and machine-tool feed may be considered as roughness, and rated in terms of microinches. The usual turned surface has a roughness of 20 to 250 mu in. rms.

Greater variations of longer wave length caused by work and tool deflection, vibrations and heat are defined as waviness.

In today's production, the economics of turning are of great importance. It is therefore desirable to select a cutting condition (feed rate, depth of cut and surface speed) that will give maximum production and at the same time stay within the limits of the allowable tolerances for surface finish.

Basically, cutting action and feed marks, and thus finish, are determined for a given material by speed and feed. For finishing operations, therefore, it is possible to predict the approximate surface finish that a given combination of speed and feed will produce. Fig 1 shows the relationship of finish to feed rate and surface cutting speed. This graph was evolved from data taken on standard lathes having rigidly mounted tooling, and workpieces having a diameter-to-length ratio greater than 1 to 10. Thus, the lathe tool-workpiece combination was sufficiently rigid to prevent the occurrence of waviness problems. AISI 4145 steel was chosen as the material to be tested. This medium-carbon steel machines to a good finish in view of its fine pearlitic microstructure. Workpieces of higher carbon steel, or heat-treated parts turned on modern precision lathes, can be expected to give better finishes.

The effect of surface speed on finish is illustrated in Fig 2, which relates these factors to three different feed rates. The high cutting speeds are most effective in producing better finishes, particularly when applied to low carbon and austenitic steels. However, above 400 fpm the effectiveness of speed in improving finish is greatly reduced.

Lighter feeds reduce feed marks and thus improve the finish, as indicated by Fig 3, which charts surface finish versus feed. Below a feed of 0.003 ipr at 400 sfpm, the influence of feed on the surface finish is not as great as the actual shear action at the nose of the tool. Further reduction of the feed rate

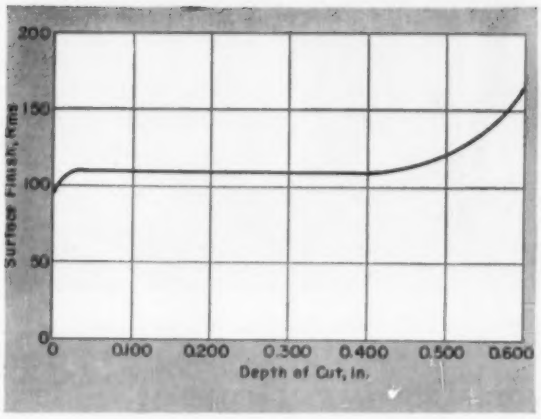


FIG. 4 . . Depth of Cut. This factor has no effect on surface quality, when conventional practice is followed

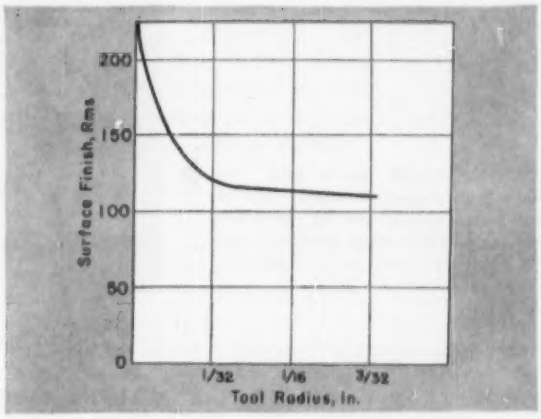


FIG. 5 . . Nose Radius. Lathe tools should have at least a 1/32-in. nose radius to avoid effect on surface finish. Test at 400 sfpm

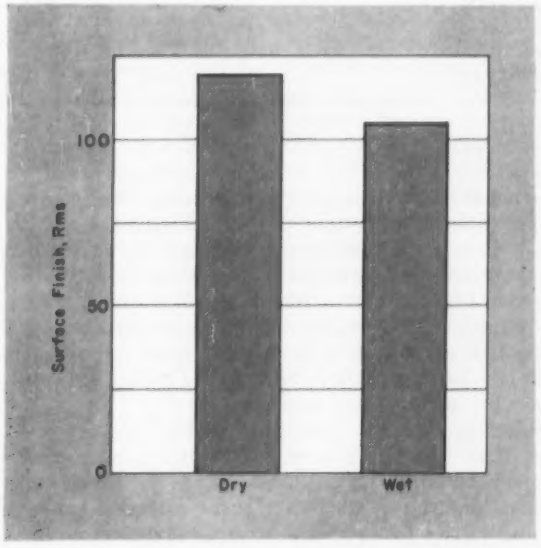


FIG. 6 . . Coolant Helps. At 765 sfpm (well beyond the 400 sfpm level, which some investigators consider the top speed at which coolant is effective), a 10:1 soluble-oil mixture improves surface finish by 15 points or nearly 12%, because of elimination of rewelding and reduction in tool wear

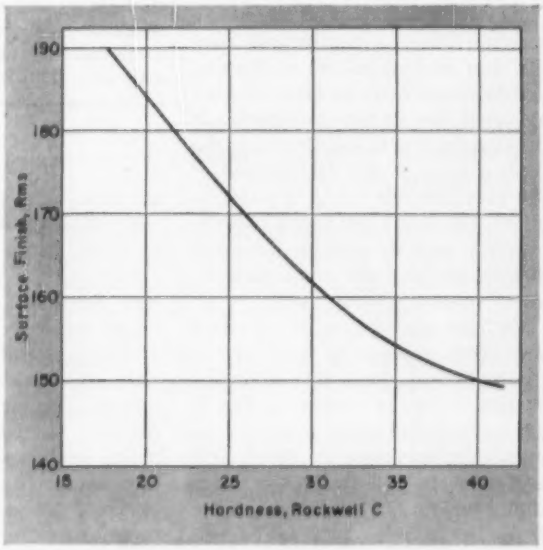


FIG. 7 . . Finish Improves With Hardness. A 4145 steel turned at 290 sfpm, 0.012 ipr and with an AR12 tool with 0.025-in. nose radius, demonstrates that surface finish is best as hardness approaches that of a heat-treated condition

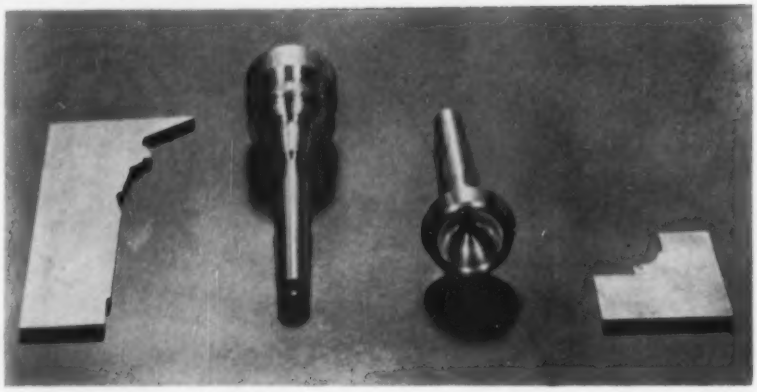
is not as effective in improving finish.

In addition to feed, speed and cutting action, other machining variables that affect surface finish are the depth of cut, tool geometry, use of coolant, nature of the chip form and the properties of the material.

Fig 4 relates the surface finish to the depth of cut. For a normal depth of cut, a change has little influence upon the surface finish.

Nose radius must be sufficiently large in relation to feed so that the tool does not create undue feed marks, Fig 5. Tool radii between 1/32 and 1/16 in. are suitable for general-purpose turning tools. Because of the critical range below 1/32-in. nose radius, it is necessary to reduce the feed rate.

When soft materials are machined, the use of positive rakes will eliminate tool buildup and will help to improve finish. Tools with negative rake and lead (side-cutting-edge angle) tend to force the chip into the work surface, with consequent scuffing and the possibility of rewelding. Positive-rake tools with a zero side-cutting-edge angle will force the chip away



CONTOUR TURNED TO 12 RMS. This trumpet mouthpiece is turned out of hard-brass barstock, and the stated surface quality is attained on production runs. The tool is rigidly mounted and the lathe spindle runs in precision bearings

from the work, and the chip will break against the tool shank with consequent prevention of scuffing and scratching of the finished surface. Parallel chip breakers are normally recommended for finish turning, because they tend to keep the chip away from the workpiece.

Rewelding can also be prevented by using the correct tool grade. If the nose radius is smaller than the feed, a ragged chip is obtained at the nose and rewelding is likely to occur. Coolant helps to prevent rewelding both by cooling the chips and by washing the small particles away from the workpiece.

Coolant also helps to lubricate the tool, preventing buildup on the tool nose. How this improves surface finish is shown in Fig 6. This graph indicates that for the particular cut taken, the finish with coolant was 105 mu in., rms as compared to 120 mu in. when cut dry. Commercial 10:1 soluble oil was the medium used.

FINISH FACTORS FOR FEEDS

The above-mentioned figures apply generally to a 0.45% carbon steel. Of course, the manner in which the material is removed is to a large extent dependent on the metal being cut. Metallurgical properties, such as hardness, alloy, microstructure and grain size, influence the finish. Table I shows finish factors that may be applied to the feed rates indicated in Fig 1, when turning different materials. Generally speaking, finish improves with increased carbon content of the steel, increased hardness, addition of free-machining additives and with reduction in grain size.

table I . . FINISH FACTORS FOR VARIOUS MATERIALS

MATERIAL	FACTOR
Brass & aluminum alloys	0.80
Low-carbon steels—A1020	0.85
Carburizing alloy steels—A8620	0.90
Med-carbon alloy steels—A4145	1.00
High carbon & tool steels	1.20
Cast iron (200 Brinell hardness)	1.50

Low-carbon steels and soft alloys tend to tear and produce rough surfaces. Tearing is particularly apparent when these materials are machined at low surface speeds. Annealed steels having pearlitic microstructures produce much better finishes than those having ferritic and spheroidized microstructures. These latter structures are softer and the ferrite in them tends to tear and produce a rougher finish.

Fig 7 shows the relationship of hardness to surface finish when machining hardened and drawn AISI-4145 steel. It can be seen that the surface finish improves with hardness, because of the resulting sorbitic microstructure. This effect levels off at R_c 38, the beginning of the bainite or martensitic structure range.

In all turning operations where finish is important, it is necessary to provide equipment that furnishes the necessary rigid relationship between the workpiece and the tool. If the workpiece is spindle mounted in a lathe, the use of proper anti-friction bearings in correct mountings is important, whenever extremely good finishes are necessary. Modern precision lathes will give finishes appreciably better than those indicated in Fig 1, because of rigidity and spindle accuracy.

The curves of Fig 1 have proved to be of general utility on production lathes, and are applicable where the turning forces involved are held within the deflection limits of the machine tool on which the work is done.

In general . . . **finish improves with an increase in carbon content, higher hardness, addition of free-machining additives, and reduction in grain size. Low carbon steels and soft alloys tend to tear and produce rough surfaces, particularly if they are machined at low speeds. Steels having pearlitic and sorbitic structures produce much better finishes than those having ferritic and spheroidized microstructures. Materials which work harden as they are machined will produce a burnished surface, which makes secondary machining operations difficult.**

Calculating tailstock offset for accurate tapers

Accuracy can only be achieved in taper turning by tailstock offset methods when the operator recognizes that the tailstock is seldom on center to start with. Thus, it is necessary to compensate for initial error from the beginning. Then by the calculations described here, in which error is reduced by the number of cycles, it is possible to turn tapers within 0.0002 in.

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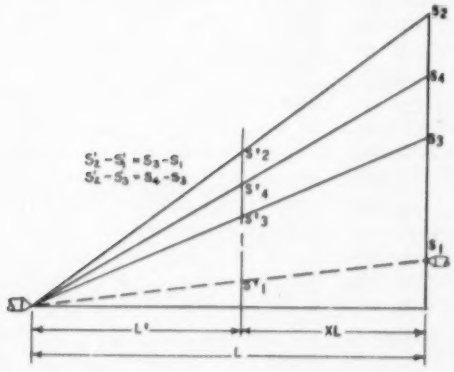
In turning accurate tapers on a lathe there is frequently an element of mystery regarding the dimension of the distance between centers to be used for computing proper tailstock offset. Tapered centers penetrate the work to a sizable depth and, because the bearing surfaces are not well defined, confusion arises concerning the true magnitude of the distance between centers.

This distance, furthermore, often is measured by a scale held between the fingers of the lathe operator. These procedures can introduce errors of ±1/64 in.

When accurate tapers are to be cut, the usual problem is to find the end points of the distance between centers and to decide with what instrument this distance should be measured. In the following analysis it is shown that the error in the taper, which results from the error which may be encountered in the distance mentioned, tends rapidly towards zero as the number of cutting cycles in the machining operation is increased. Thus, it is possible to produce a finished taper with only negligible error, providing an adequate number of cutting cycles are employed.

In the sketch, assume that S_1 represents the instantaneous position of the tailstock. The quantity



XL represents the error in L which is the true distance between centers. The geometry assumes that the value for L determined by the lathe operator is smaller than the true existing value of L. The magnitude of this underestimated dimension is L′.

Assume the required taper to be $\frac{S_2}{L}$. To cut a taper of this magnitude, it is necessary to change the position of the tailstock by an amount equal to (S_2-S_1). The lathe operator, however, will compute this positional change on the basis of the dimension L′. Therefore, the position of the tailstock actually will be changed by the amount $(S_2'-S_1')$ instead of the correct amount (S_2-S_1). The actual taper resulting from this condition is determined by the position S_3. From this geometry,

$$\text{present instantaneous taper} = \frac{S_1}{L} = \frac{S_1'}{L(1-X)}$$

$$\text{final required taper} = \frac{S_2}{L} = \frac{S_2'}{L(1-X)}$$

$$S_2' = (1-X)\ S_2,\ S_1' = (1-X)\ S_1$$

and $$(S_2'-S_1') = (1-X)\ (S_2-S_1)$$

as $$S_3 = S_1 + (S_2'-S_1')$$

$$S_3 = S_1 + (1-X)\ (S_2-S_1)$$

The error which results in the taper from miscalculation in the positional change of the tailstock is represented by (S_2-S_3) where $S_2-S_3 = S_2-S_1 + (1-X)(S_2-S_1) = X(S_2-S_1)$.

At the end of this cutting cycle the operator senses that the correct taper has not been obtained and proceeds on this basis to perform again the computation which will render the required taper. This computation, however, is again based on the erroneous dimension L′. The position of the tailstock will be changed by the amount $(S_3'-S_2')$ instead of the proper amount (S_2-S_3).

This error will result in the final position S_4 instead of the required position S_2. Because S_3, under the present condition, is analogous to the preceding position S_1, and S_4 is analogous to the preceding position S_3, make the following substitutions in subscripts. Replace subscript 1 by 3 and 3 by 4. Subscript 2 remains unchanged.

Consequently, $(S_2-S_4 = X(S_2-S_3) = X^2(S_2-S_1)$

Thus, the resulting error (S_2-S_4) is given by the preceding relation. By a similar procedure the error resulting after n cutting cycles is obtained as:

$$(S_2-S_n) = X^n\ (S_2-S_1)$$

From the last equation it may be seen that the error (S_2-S_n) tends to vanish rapidly as the number of cycles n increases. For the purpose of obtaining a numerical estimate of the size of this error, let the error in L be ⅛ in., and let $(S_2-S_1) = 1$ in. Assuming $n = 3$ cutting cycles,

$$S_2-S_n = (\tfrac{1}{8})^3(1) = 0.002 \text{ in.}$$

An additional cutting cycle will reduce the error to 0.0002 in.

How to make money by metal selection

"More for your money" interests everyone—and the "how" of getting it is even more interesting. In Metalworking, this "how" usually is tied in with production cost per piece. And the cost is a composite of labor, material, equipment expense, and producibility. Thus, material cost must be balanced against producibility as well as weight in determining the ultimate profit per piece. This article describes the calculations

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To convert metals from semi-finished shapes to finished, marketable pieces, the metals most readily worked are usually the most profitable. Only the premium paid for special knowledge in working the extremely difficult materials might prove otherwise. Thus the cost per pound, alone, does not decide the final cost per piece.

An important factor in selecting materials, when the physical characteristics are comparable, is the number of pieces that can be produced in a unit of operation time—per minute or hour or day. Compare cost *and* producibility.

Whether automatic screw machines, for example, are in a contract shop or are "captive," the principles of cost analysis are equally applicable. The essential ingredients are the labor-plus-overhead costs per machine, parts per hour from that machine, and the scrap value of the metal.

Take two cases of the same part made from free-cutting brass rod and from steel: In the first, brass results in a considerably lower cost, while in the second case the steel shows an advantage.

First, let's discuss the calculations in Table I. The set marked "Part A" was made on a 5-spindle Davenport using B1113 steel rod, on one occasion, and regular half-hard free-cutting brass rod on another occasion. Prices for metal are on the same quantity basis. Overhead of $6.50 per hour is set by the contract shop doing the work. Pieces per hour are as produced.

The set marked "Part B" was made on a 6-spindle Acme-Gridley, using B1113 steel rod at one time and a free-cutting brass at another time. Overhead of $6.50 per hour was set by the contract shop, a different one, however, from Part A. Parts per hour are actual.

While different shops will use different overhead rates per machine, the principles are the same. Later discussion will show the effect of varying this overhead. (And it is a good idea to reevaluate your overhead at frequent intervals.)

Analyzing the figures for Part A, the cheapest net cost results from using brass rod, even though the rod price is much higher. Basic reason is the much higher output per hour per machine resulting from the better machinability of this brass. A further saving is found in the greater scrap value of brass.

Looking at Part B, costs are close to being even for the two materials, although steel has a slight edge. When the choice is this close in actual cost, the user must weigh in factors such as tool life, corrosion resistance, finish, and work load.

The greater machine availability made possible by using a metal which permits a higher cutting rate can be an important advantage, both in versatility and in the return on equipment investment. The problem of tool life can be a further criterion, especially on complex parts requiring special form tools.

The figures in Table I also can be used in a different way—by constructing Charts I and II as shown, which are extremely valuable to visibly demonstrate how relationships in overhead and machining rates may be varied to radically affect the net costs between two different metals.

Only three facts need be known to make the basic charts: (1) Net cost per 1000 pieces; (2) Metal cost per 1000 pieces; and (3) Labor plus overhead per machine. The vertical scale is dollars per 1000 pieces and the horizontal scale is labor-plus-overhead in dollars per hour.

For practice, let's construct Chart I for Part A. Point *A* is $3.66 (line 7a, brass) and point *B* is the intersection of overhead cost at $6.50 (line 8) and net cost of $5.98 (line 12). Connect points *A* and *B* to provide the line showing brass relationships.

Now construct the same line for steel; that is, point *C* or $1,23 (line 7a, steel) and point *D*, $6.50 (line 8) and net cost per 1000 pieces of $10.51 (line 12). Connect point *C* and *D* for steel. Also, draw line X - Y, vertically, from the intersection of the brass and steel lines down to the horizontal base.

What do these lines mean? First, any time line X - Y is to the left of the "set rate" or overhead line (in this case $6.50), the metal being compared, in this case steel, will be more costly than the metal used as a basis of comparison, in this case brass. The only way steel can compete with the cost of brass is either to increase the machining rate or to decrease the labor-plus-overhead cost to $2.20 per hr (line X - Y meets the horizontal scale at $2.20). Actually, this machine cannot be profitably operated at such low overhead; nor can the machining rate for steel be increased by four times.

Constructing Chart II for Part B by the same method will show a different situation. Point *A* is $6.95 raw material cost per thousand pieces, and point *B* is the net cost

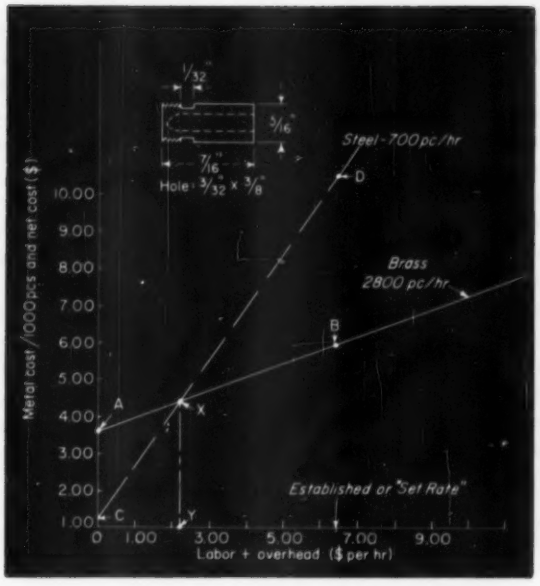

Chart I

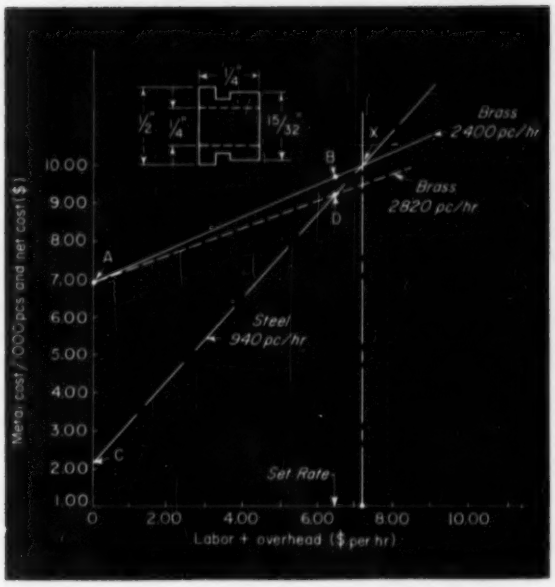

Chart II

per thousand at $6.50 labor-plus-overhead or $9.66 (line 12). Point *C* is $2.28 (line 7a) the raw metal cost per thousand pieces using steel, and point *D* is the net cost per thousand pieces at the set rate of $6.50, or $9.20. Connect points *C* and *D*, then draw the vertical line X - Y from the intersection of the brass and steel lines to the horizontal.

In studying Chart I it was said that any time line X - Y was to the left of the set-rate line, steel would cost more than brass. In this case line X - Y is to the right of the set-rate line, hence steel is less expensive than brass.

What else can these charts show? For one thing, Chart II shows that $7.20 is the correct overhead to turn out brass or steel parts at the same cost. By inference it also says that the brass is not being machined at an efficient rate. What is the proper rate?

A simple calculation will show the higher rate possible. Thus, 2400 pieces of brass and 940 pieces of steel are machined per hour, which is a ratio of about 2.5 to 1. Arbitrarily, take a ratio of 3 to 1 or 2820 pieces per hour. This increase will change the value of line 10, or 650 ÷ 2820, equalling 0.00231, which gives a new net of $9.126 per thousand, a saving of 43.4 cents.

Table I

		Part A		Part B	
		Brass	Steel	Brass	Steel
(1)	Gross wt/pc (lbs)	0.0114	0.0105	0.025	0.023
(2)	Cost/lb (dollars)	0.3844	0.1187	0.3642	0.1025
(3)	Material Cost/pc ((1) x (2))	0.00438	0.00125	0.00911	0.00235
(4)	Weight Scrap/pc (lbs)	0.0040	0.0037	0.012	0.011
(5)	Scrap Value/lb (dollars)	0.1800	0.0062	0.1800	0.0062
(6)	Scrap Credit/pc (dollars) (multiply (4) by (5))	0.00072	0.00002	0.00216	0.00007
(7)	Net Metal Cost/pc (dollars) (subtract (6) from (3))	0.00366	0.00123	0.00695	0.00228
(7a)	Net Cost per 1000	($3.66)	($1.23)	($6.95)	($2.28)
(8)	Labor & Overhead/hr (dollars)	6.50	6.50	6.50	6.50
(9)	Pieces Machined/hr	2800	700	2400	940
(10)	Labor & Overhead/pc (dollars) (8) divided by (9)	0.00232	0.00928	0.00271	0.00692
(11)	Net Cost/pc dollars) (add (7) and (10))	0.00598	0.01051	0.00966	0.00920
(12)	Net Cost per Thousand	$5.98	$10.51	$9.66	$9.20

All of these data imply other things too, of real value to the screwmachine operator. They show how he can increase the return on his machines if he is running them on parts from materials which do not allow the full capacity of the machine to be used.

The data also indicates whether the machines being used are actually competitive. Some machines are so slow that the machinability of a metal cannot be utilized.

Old machines with low overhead rates, because they are fully depreciated, are not as cheap as they sound—even discounting the added maintenance and downtime expense. Part A shows this. A rate of $2.20 per hour shows equal costs for brass and steel, yet an overhead of $6.50 can be used and still the operator can sell parts cheaper.

14 steps TO DESIGN A DIE

STEP 8..

How to design finger stops

J R PAQUIN

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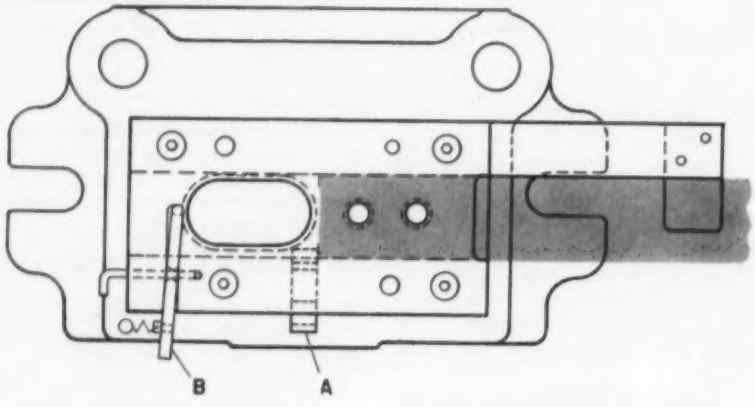
Finger stops, or primary stops as they are sometimes called, are used in dies with two or more stations. They register the strip for performing preliminary operations prior to strip engagement by the automatic stop or roll feed. The number of finger stops used depends upon the number of stations in the die. For hand feeding it is always one less than the total number of stations. Finger stops are made of cold-rolled steel, cyanide hardened.

In the early days of press work, numerous vertically acting primary stops were used. The hazard of placing fingers between the upper and lower die members has caused them to fall into disrepute. Presently, almost the only finger stops used in modern plants are the horizontal types described.

Illustrated are 15 standardized finger stops fully tabulated to aid the designer in selecting the right one for the conditions encountered. Machining data are given for accompanying front spacers. In addition, general rules are outlined to help in the correct application of these die components. This article further explains Step 8 in the 6-page insert—"14 Steps to Design a Die" (*AM*—Oct, '55, p129).

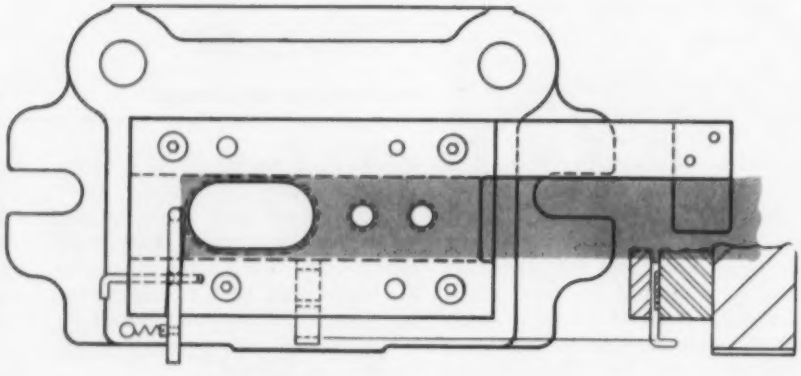
1.. TAKEN TOGETHER . . .

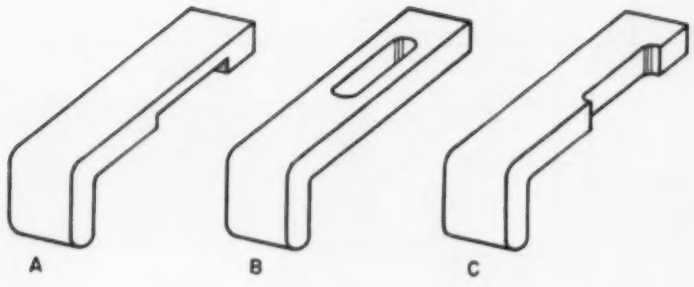
this illustration and Fig 2 explain the operation of a typical finger stop. As shown in this plan view of a two-station die, two holes are pierced at the first station, and the blank is removed from the strip at the second station. Finger stop *A* has been advanced to operating position; the strip is pushed against its toe by the operator, and the press is tripped, piercing the two holes. The toe of automatic stop *B* has been pulled to the right by the automatic stop spring



2.. THE FINGER STOP...

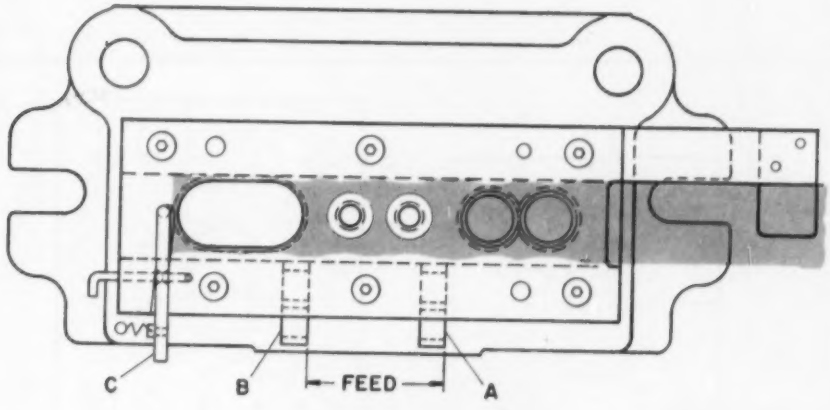
has now been pulled back toward the operator, allowing the strip to be fed toward the left until it contacts the toe of the automatic stop, "setting" it. Tripping the press produces a full blank and two pierced holes. Subsequently, the operator simply keeps the strip firmly against the automatic stop until all blanks have been removed. Usually, conventional front and side section views of the die are used to show the form of blanking and piercing punches. So, on the die drawing the side view of the finger stop is projected to the right as a partial section view





3.. THREE COMMON METHODS . . .

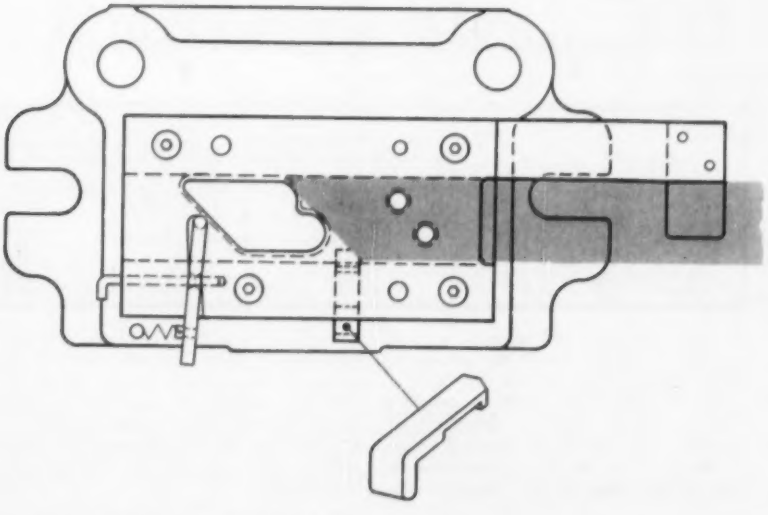
of making finger stops are illustrated. At *A* the bottom of the stop is milled to provide a slot for limiting travel, and to retain the stop in the front spacer. The stop at *B* has an end-milled slot machined along its center. A dowel engages this slot to limit stop travel. Similarly, the stop at *C* has a partial slot cut along its edge to limit travel. Because it does not require a dowel, the stop at *A* is preferred. The designer should always be on the lookout for ways to eliminate unnecessary parts. Also, end-milling of long, narrow slots is slow and expensive



4.. IN MULTIPLE-STATION DIES . . .

finger stops locate the end of the strip for each station, except the automatic stop station when one is used. In this die two extruded bosses are applied to the strip at the first station, stop *A* positioning the strip. Two holes are pierced at the second station, stop *B* engaging the end of the strip for locating them. At station 3 the part is blanked, automatic stop *C* locating the strip end.

When a roll feed is used, only one finger stop is required, applied at the first station. The roll feed advances and positions the strip for all succeeding stations. Pilots perform the final, accurate positioning



5.. FOR SOME PART CONTOURS . . .

it is necessary to shear the end of the strip at an angle for starting it through the die. In such applications the end of the finger stop is beveled to the angle applied to the strip end

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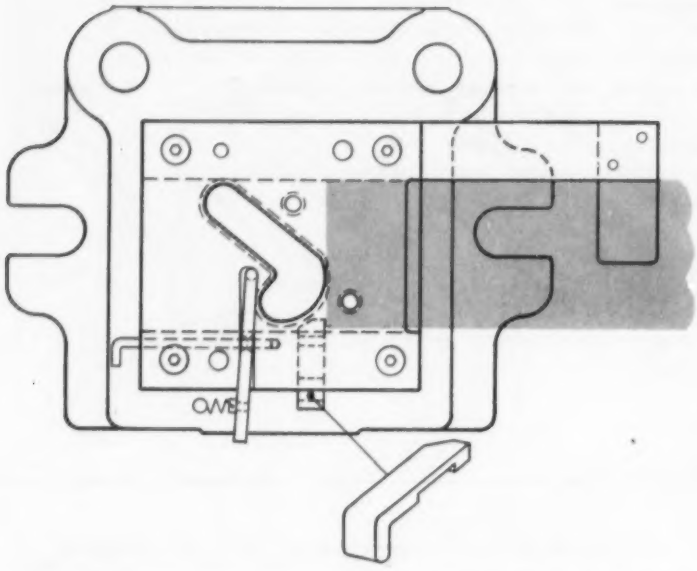
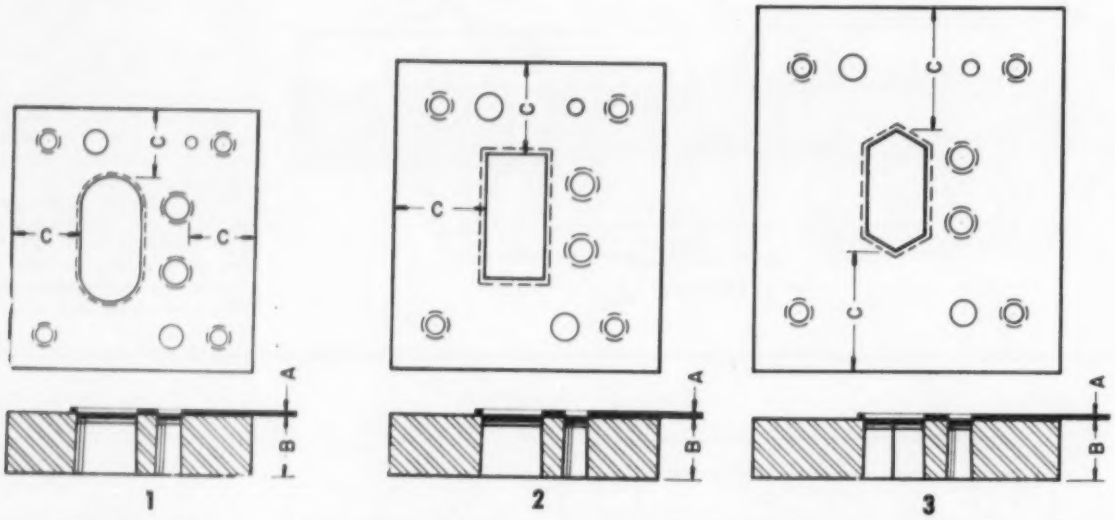


6.. ALWAYS CHECK . . .

to make sure that the corner of the finger stop will not be sheared off by the blanking punch. Where interference occurs, bevel the end of the finger stop



9.. FINGER-STOP PROPORTIONS . . .

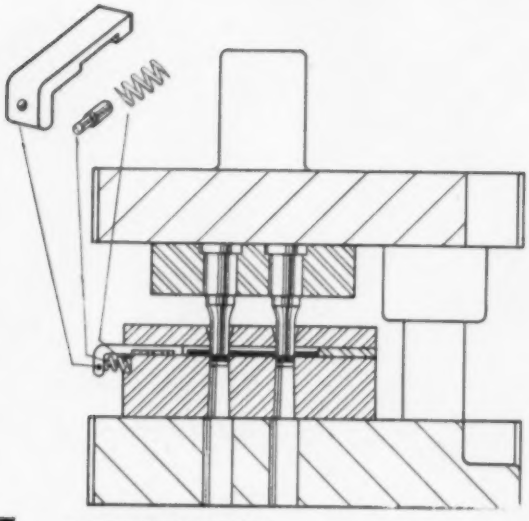
can only be determined after the width of the front spacer has been established. Front-spacer width, in turn, is governed by the minimum distance *C* of the die block, which can be used for the particular job. Minimum distance *C* of the die block depends almost entirely on the contour of the die hole. Secondary considerations are:

1. Extent of straight lands. Where these are very long the die block is subjected to considerable side pressure during the cutting process. It is often advisable to use a minimum distance *C* in the thicker ranges regardless of die-hole contour.

2. Size of the die-hole opening. When openings are large and material strip is thick, it is wise to go to the thicker *C* ranges regardless of die-hole contour.

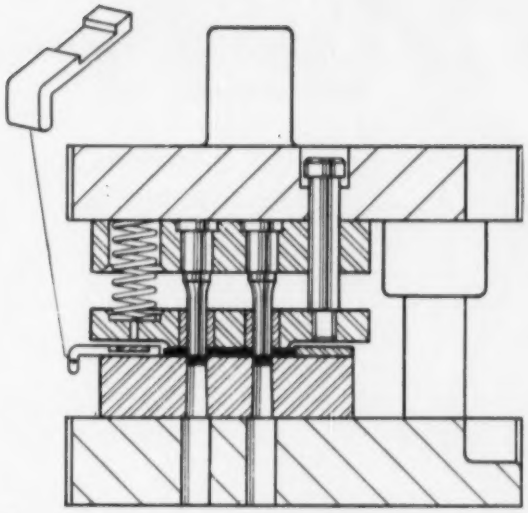
A	B	C		
		MINIMUM DISTANCE - DIE HOLE TO OUTSIDE EDGE		
STRIP THICKNESS	DIE BLOCK HEIGHT	1 SMOOTH DIE HOLE CONTOUR (1 1/8 B)	2 INSIDE CORNERS (1 1/2 B)	3 SHARP INSIDE CORNERS (2 B)
0 to 1/16	15/16	1.0547	1.4062	1.875
1/16 to 1/8	1 1/8	1.2656	1.6875	2.250
1/8 to 3/16	1 3/8	1.5469	2.0625	2.750
3/16 to 1/4	1 5/8	1.8281	2.4375	3.250
over 1/4	1 7/8	2.1094	2.8125	3.750

For die holes with smooth, or rounded, contours, view 1, minimum distance *C* is generally 1¼ times the thickness *B* of the die block. When the die hole contains inside corners (view 2) the minimum distance *C* is generally 1½ times die-block thickness *B*. View 3 shows severe inside corners in the die-hole contour. Minimum distance *C* is then made twice the thickness of the die block. These minimum distances are tabulated for recommended die-block heights, which in turn are governed by strip thickness *A*



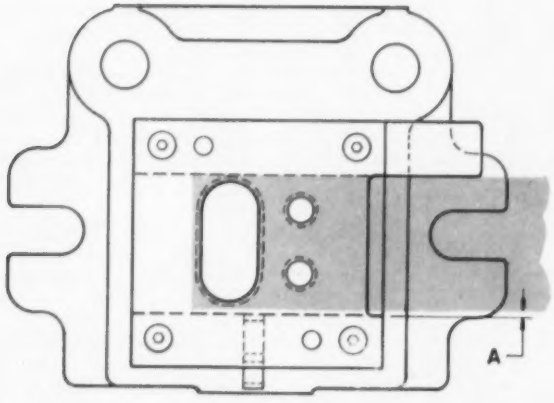
7.. A RETURN SPRING . . .

is not ordinarily required on finger stops. However, when the front edge of the material is notched, and a possibility exists that the stop might work inward under vibration and engage in the notch to cause a misfeed, a return spring would be used. A small guide pin, riveted to the finger stop, holds and guides the spring



8.. WHEN A SPRING STRIPPER . . .

is used, the slot in the finger stop is inverted, providing a convenient means of retaining the stop in the front stock guide

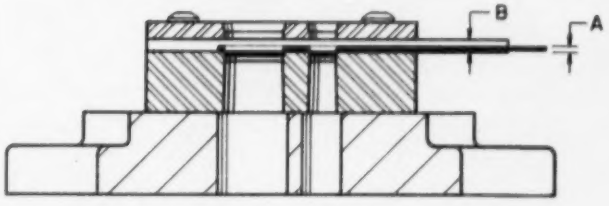


STRIP THICKNESS	A HAND FEED	A POWER FEED
0 to 1/16	1/16	1/32
1/16 to 1/8	3/32	1/32
1/8 to 3/16	1/8	1/32
3/16 to 1/4	5/32	1/32
over 1/4	3/16	1/32

10.. ANOTHER FACTOR . . .

must be known before finger-stop proportions can be determined. Distance *A* between the strip edge and the front spacer must be known, because this dimension determines the amount of finger-stop travel required to stop the strip in a positive manner. Tabulated are recommended distances *A* for hand feeding using an automatic stop, and power feeding using a roll feed or hitch feed. Distances *A* are given for various strip thicknesses

A STRIP THICKNESS	B FRONT SPACER THICKNESS
0 to 1/16	1/8
1/16 to 1/8	3/16
1/8 to 3/16	1/4
3/16 to 1/4	5/16
1/4 to 5/16	3/8



11.. RECOMMENDED FRONT-SPACER . . .

thicknesses are tabulated. These allow a minimum of 1/16 in. clearance between the top of the strip and the underside of the stripper plate, to provide for possible curvature in the strip

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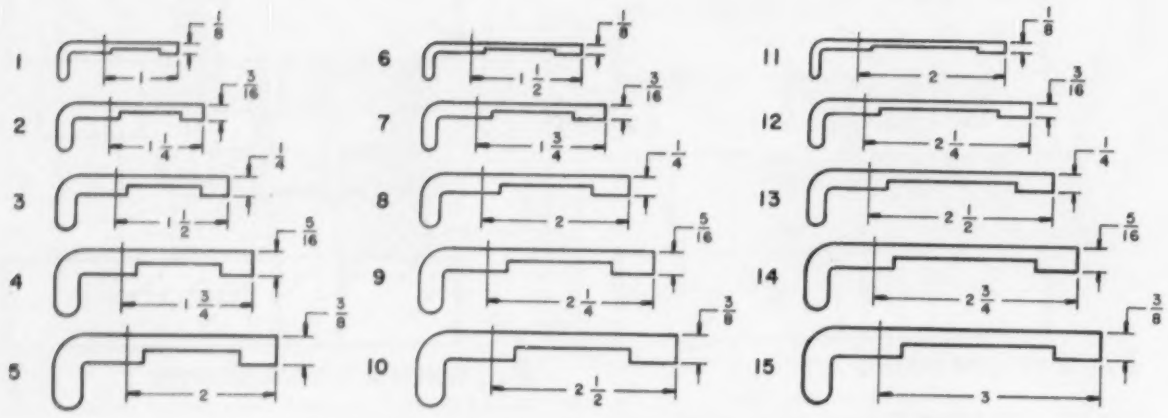


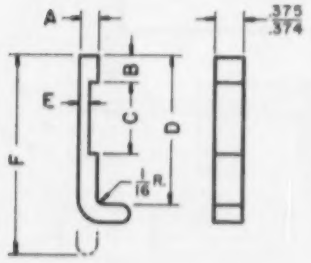
A STRIP THICKNESS	1 SMOOTH DIE HOLE CONTOUR		2 INSIDE CORNERS		3 SHARP INSIDE CORNERS	
	Front Spacer Width	Finger Stop No.	Front Spacer Width	Finger Stop No.	Front Spacer Width	Finger Stop No.
0 to 1/16	1	1	1 1/2	6	2	11
1/16 to 1/8	1 1/4	2	1 3/4	7	2 1/4	12
1/8 to 3/16	1 1/2	3	2	8	2 1/2	13
3/16 to 1/4	1 3/4	4	2 1/4	9	2 3/4	14
over 1/4	2	5	2 1/2	10	3	15

12.. PROPORTIONS . . .

of these 15 finger stops enable ready selection for almost any die design, and they assure positive stopping of the strip. In both the forward and return positions the maximum thicknesses of the stops remain confined in the front spacer for strength.

This table corresponds, for practical purposes, to the one in Fig 9, and from it the designer can choose the most suitable finger stop for the conditions confronting him. For example, if 3/32 in. thick strip is to be run, and the die hole contour is smooth and curved, it would fall in the second line: Strip thickness *A*—1/16 to ⅛. Recommended front spacer width for this condition is 1¼ in., and finger stop No. 2 should be used. The 1¼ in. dimension corresponds roughly to line 2 of Table 9 for smooth die-hole contour with a dimension of 1.2656 in. For 1/32 in. thick strip, with sharp inside corners in the die hole, front spacer width, line 1, would be 2 in. and finger stop No. 11 should be used.

When in doubt as to correct classification of die-hole contour, use the next greater minimum distance. Only the front-spacer width and thickness have been mentioned, but it is understood that the back gage is made the same width and thickness



NO.	A	B	C	D	E	F
1	.125	1/4	21/32	1 15/32	.062	1.820
2	.187	5/16	13/16	1 3/4	.093	2.259
3	.250	3/8	31/32	2 1/32	.125	2.635
4	.312	7/16	1 1/8	2 5/16	.156	3.012
5	.375	1/2	1 9/32	2 19/32	.187	3.388

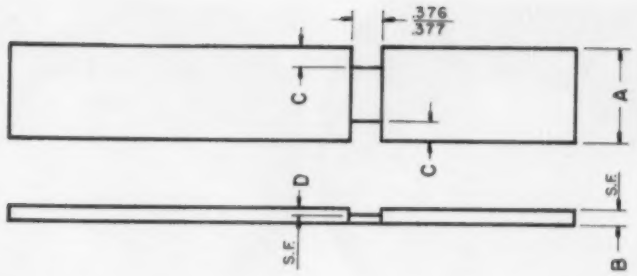
NO.	A	B	C	D	E	F
6	.125	3/8	15/16	2	.062	2.414
7	.187	7/16	1 3/32	2 9/32	.093	2.790
8	.250	1/2	1 1/4	2 9/16	.125	3.166
9	.312	9/16	1 13/32	2 27/32	.156	3.543
10	.375	5/8	1 9/16	3 1/8	.187	3.920

NO.	A	B	C	D	E	F
11	.125	3/8	1 7/16	2 1/2	.062	2.914
12	.187	7/16	1 19/32	2 25/32	.093	3.290
13	.250	1/2	1 3/4	3 1/16	.125	3.666
14	.312	9/16	1 29/32	3 11/32	.156	4.043
15	.375	5/8	2 1/16	3 5/8	.187	4.420

13.. ALL NECESSARY DIMENSIONS . . .

are given for making finger stops ranging from No. 1 to 15. From this table the designer can quickly apply dimensions, or the finger stop can be specified by number. Note that:

1. Stops 1 to 5 are used when smooth contours exist in the die hole
2. Stops 6 to 10 are used when the die hole has inside corners
3. Stops 11 to 15 are used when the die hole contains sharp inside corners



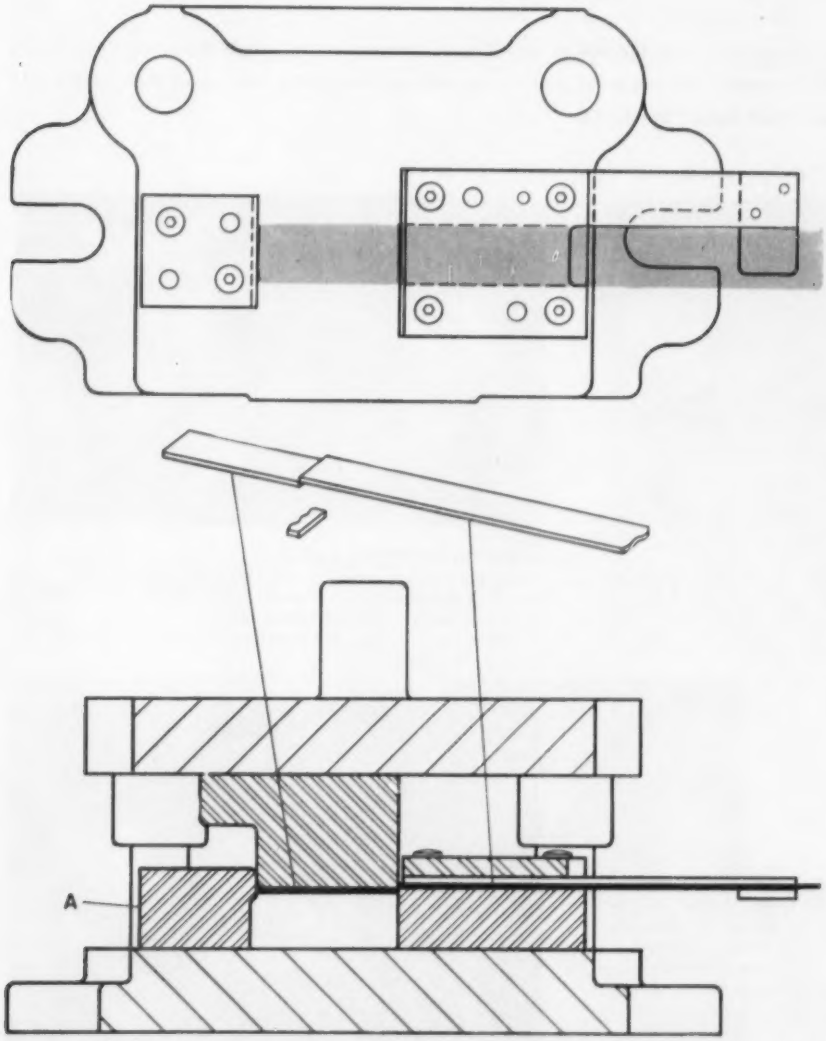
NO.	A	B	C	D
1	1	1/8	1/4	.064
2	1 1/4	3/16	5/16	.095
3	1 1/2	1/4	3/8	.127
4	1 3/4	5/16	7/16	.158
5	2	3/8	1/2	.189

NO.	A	B	C	D
6	1 1/2	1/8	3/8	1/16
7	1 3/4	3/16	7/16	3/32
8	2	1/4	1/2	1/8
9	2 1/4	5/16	9/16	5/32
10	2 1/2	3/8	5/8	3/16

NO.	A	B	C	D
11	2	1/8	3/8	1/16
12	2 1/4	3/16	7/16	3/32
13	2 1/2	1/4	1/2	1/8
14	2 3/4	5/16	9/16	5/32
15	3	3/8	5/8	3/16

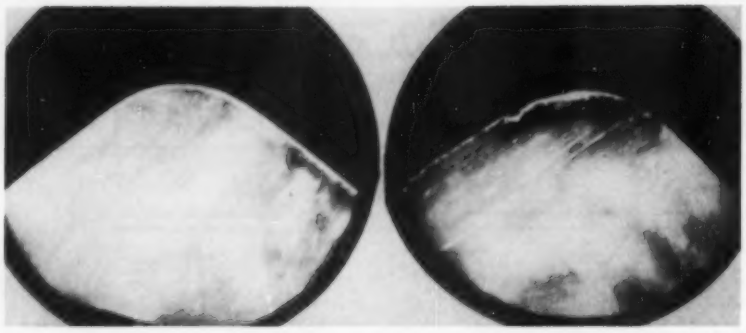
14.. SLOT-MACHINING DIMENSIONS . . .

for front spacers are tabulated to correspond with the finger stops in Fig 13. Machining the front spacer in this way does not affect its function, because it is simply a spacer between the die block and stripper plate



15.. WHEN ARE FINGER STOPS...

not needed in a die? For most cut-off dies, finger stops are not required. Illustrated at left is a simple cut-off die for producing rectangular blanks. In operation the end of the strip is advanced until it projects slightly past the cutting edge. Tripping the press trims the end of the strip square. The strip is then advanced against stop *A*, which also backs up the cut-off punch to prevent deflection while cutting. No finger stop is needed, because trimming the end of the strip prepares it for register against stop *A*



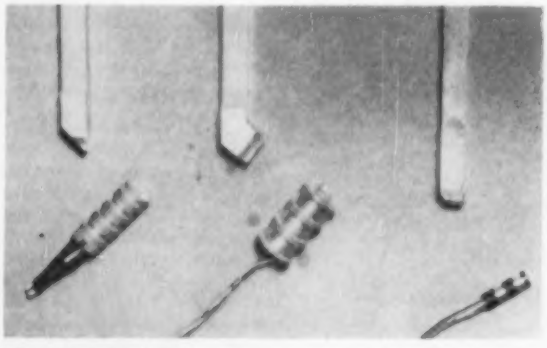
Diamond turning tool . . .
has smooth, almost perfect edge because it can only be formed by lapping with diamond dust. Major danger is from impact, which causes chipping. Damaged tool (right) was removed from machine after boring 62,312 engine cylinders. Aside from chip on edge, tool is still good

Diamond Cutting Tools . . .

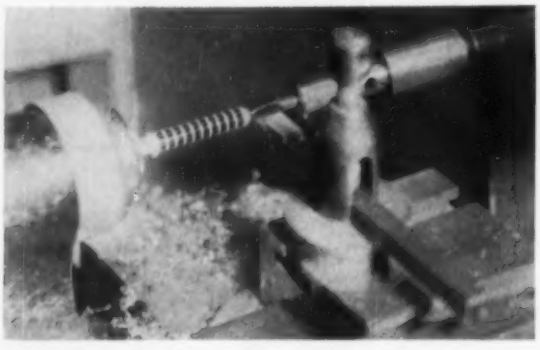
HIGHER PRECISION, LESS DOWNTIME FOR RESHARPENING

For special jobs, usually (but not always) in non-ferrous or non-metallic materials, diamonds are tops. They're not difficult to handle, but watch out for weak tool supports and for machines that don't run dead true. Here are some typical setups, originally presented before the ASTE

JOSEPH KLIPPER, vice-president & general manager, CLIPPER DIAMOND TOOL CO

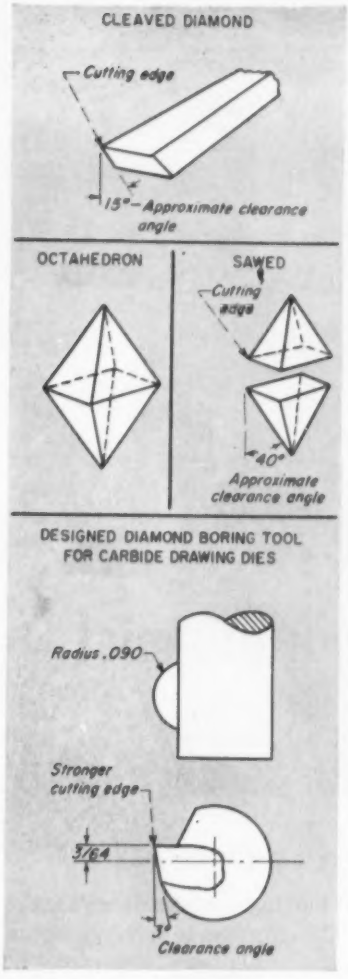


Three typical tools . . .
with parts they machined, look somewhat like ordinary metal-cutting tools. Chip adhesion is impossible; nothing sticks. Rake and clearance angles are minimum to provide strength. Machine may be run at highest speed, but spindle can't vibrate; tool must be rigid, held without spring or chatter

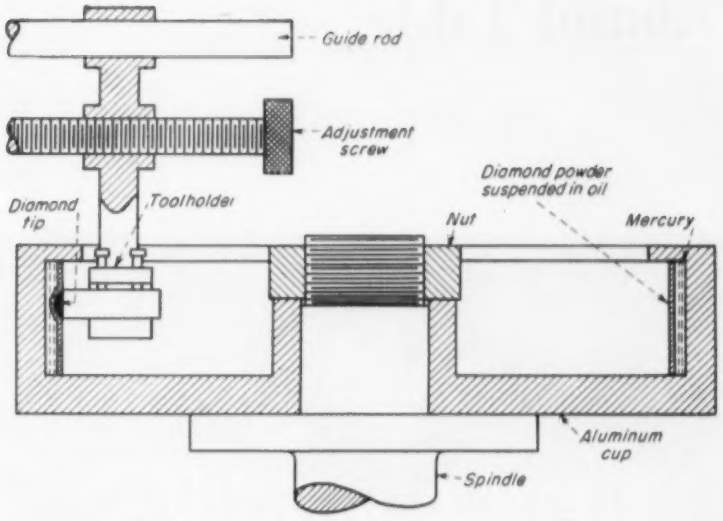


Slip-ring assembly . . .
was combination of synthetic-resin base with nickel-alloy rings; turned by diamond tool to 4-mu-in. finish. Diamond did 1000 before resharpening; carbide tool on same job would only complete 15 before resharpening. Diamonds do well on abrasive materials that ruin carbides

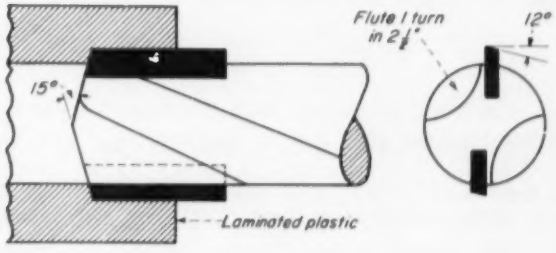
Combination boring bar . . .
for cast aluminum pistons has carbide roughing tool on nose, diamond finishing tool mounted back far enough so both can't cut at same time. Average production run before resharpening was 50,000 pc for each diamond tool. Savings on downtime (over carbide finisher) per million pistons amounted to 256 hr; $209 on tool costs, even though diamond cost $45 as against $1.15 for carbide



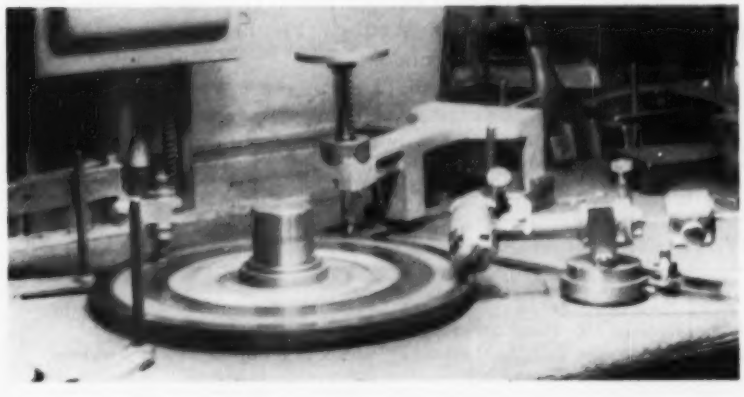
Tools must be ground and lapped . . .
because normal angles caused by cleaving or sawing diamonds are too large for edge strength. Formed boring tool shown has only 3° clearance, and can be applied for cutting cemented carbides, taking cuts as deep as 0.015 in.



Unusual scoring setup . . .
was required to groove edge of diamond tool so it would cut 8-mu-in. finish with satin—not shiny—appearance. Diamond powder suspended in oil was spun in centrifuge over mercury so it flowed past tool tip at 6500 sfpm—wearing away edge to make fine grooves. The 10-in. drum rotated at 3000 rpm



Reamer for plastic bushings . . .
finished 300,000 to 800,000 pc per resharpening, to 0.001-in. accuracy. Job was on automatic screw machine, where carbide tools managed only 20,000 pc/resharpening. Automatic machines allow maximum advantage from less downtime for resharpening



One way of lapping diamonds . . .
is on cast-iron wheel charged with diamond dust. Most diamonds are single crystals—one continuous lattice. Small crystals lumped together like grinding-wheel grit are called Brazilian carbonados. Only difference between tool and gem stones is size and color

Round Table

Good Bye, Mister Mechanic!

"Did you win your argument with Personnel about Holland taking that job in Engineering, Al?"

"Nope; they seem to think the company needs a junior draftsman more than it needs a mechanic's helper. I tried to argue with Holland, too, but it's no use He's made up his mind."

"I suppose he wouldn't be much use to you, anyhow, if you did get him to stay. He's pretty hepped up on his new white-collar job."

"Yeah, and that's what gets me, Ed. How come so many shop men think the easy road to success is upstairs in an office? I can show them plenty of examples where shop men have become top executives. Look at Harrison, for instance. He didn't get to be supervisor by sitting on his duff at a drawing board."

"He's a pretty exceptional guy, Al; even if he is a bull-headed baboon sometimes."

"Sure he is, and so would anyone be who got to his position. Just moving upstairs doesn't make it any easier, Ed. The guy has to have plenty of moxie to move up in the company, and where he works doesn't have that much to do with it."

"Well, I can still see Holland's point, Al. He's going to get a chance to go to school at company expense, and that ought to help him a lot."

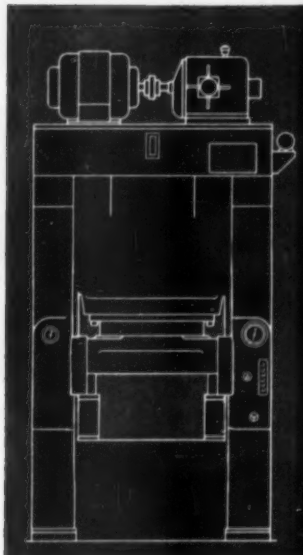
"He can learn just as much down here, Ed. A good-all around mechanic is a rare bird these days. And because he's so rare, he can look just as good in a shop apron as a draftsman looks. And just because he uses his hands doesn't mean he doesn't have to think. It takes as much brainpower to turn out good tooling as it does to push a pencil around."

"But Holland can make more money in a little while upstairs, Al."

"Did you ever compare take-home pay with some of those white-collar boys, Ed? You'd be surprised, I think; and I'll bet they would, too."

***DO SOME SHOP** men have too much respect for white collar jobs? Can a young man with ambition do just as well, financially and in position, in the shop as in an office? Your opinions may help others. Discussions of earlier topics start on page 230.*

American Machinist
SPECIAL REPORT NUMBER 432



How to figure HUBBING PRESSURE AND COST

JOHN H HAYES, ROCKWELL MACHINE TOOL CO, LTD, LONDON

- **Sinking of die and mold cavities by cold hubbing is an attractive proposition cost-wise. The combined cost of hub and cavity may amount to a fraction of that for a machined cavity. And the advantage of hubbing increases when duplicate tools are required.**

- **Until now it has been difficult to figure the pressures required to hub. By using a number of examples, however, the relationship of hubbing pressure to ultimate tensile strength of the material has been established. This finding is of value for estimating the pressure to hub a shallow symmetrical cavity.**

- **Case examples illustrate the kinds of cavities sunk for forging dies, header dies and molds. Tabulated data give the depth and surface area of the impression, the hubbing pressure and the ultimate tensile strength of the steel, so that the reader has a yardstick for his own work. Finally, the costs of making several of these products are compared for hubbing and machining. In one instance, machining costs 15 times as much!**

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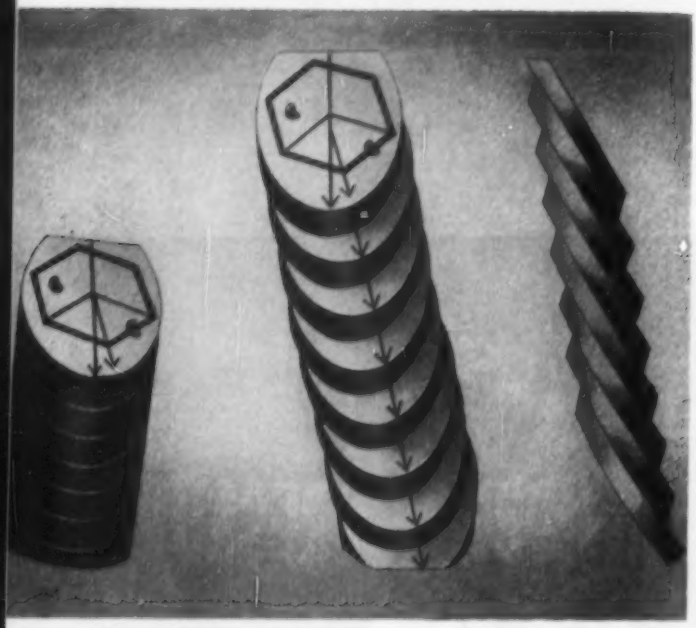
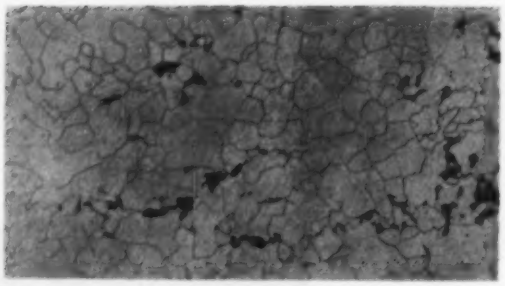


FIG. 1 . . Sliding mechanism of crystals. Sachs, Fink, Mark, Polanyi, Schmid (1922)



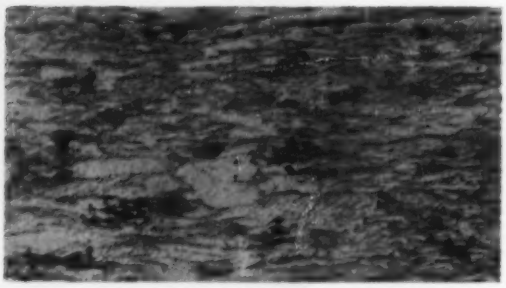


FIG. 2 . . Change of structure through hubbing (0.1% C steel) produces twice the hardness

Hubbing Improves Die or Mold Wear

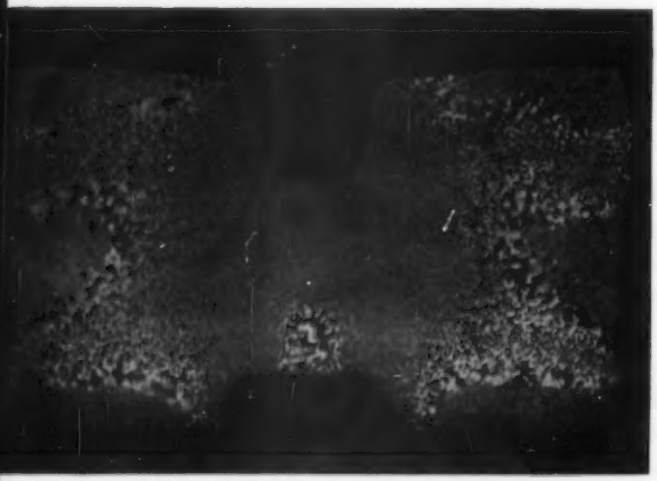


FIG. 3 . . Recrystallized cavity of die block. Relief of the base is a controversial subject

To sink the impression and refine the steel, modern hubbing practice makes use of highly developed hydraulic presses. These afford close control over ram speed and have extremely accurate alignment of the ram slide. For convenience upstroking presses are often preferred. Devices for cut out at predetermined pressure and depth are frequently employed. In some instances multi-stage hydraulic pumps are incorporated, giving rapid approach at low pressure, followed by the necessary "squeezing" at high pressure, and an intermediate stage which is useful for ejecting the finished piece.

HUBBING PRACTICE

In broad terms, the actual hubbing operation consists of pushing a hardened master punch (hub) into solid die material. The die insert (nib) is generally retained in a hardened shroud (chase) which prevents the nib from bursting.

Study of the crystal mechanism involved in hubbing will lead to a more ready understanding of what takes place:

The die material prior to hubbing consists of an amorphous crystal structure. During hubbing the crystals deflect along slip planes (Fig 1), while the metallic interconnection between the crystals remains undisturbed. At regions of local cold deforma-

table I . . ENGLISH HUBBING AND HUB STEELS

Type	Analysis (per cent) C	Si	Mn	Cr	Ni	Mo	T	V	Characteristics
				HUBBING STEELS					
P.H.S.	0.1								Specially melted for cleanliness and grain control, free flowing
A 13	0.4			1.2	1.5		0.5		Suitable for forging dies and inserts
Chrome molybdenum die steel	0.35			4.0		0.6			Suitable for forging dies and inserts
Chrome hubbing steel	0.05		0.3	5.0		0.9		0.25	Pressure die casting and plastic molds requiring highest core strength
				HUB STEELS					
Double six	1.9			12.5	1.5		0.5		Through hardening, high compressive strength
Imperial oil hardening	1.3			0.5			4.5		Through hardening, high compressive strength

table II . . SWEDISH HUBBING AND HUB STEELS

Type	Analysis (per cent) C	Si	Mn	Cr	Ni	Mo	T	V	Characteristics
				HUBBING STEELS					
1	0.05	0.1	0.1						Like P. H. S.
2	0.06	0.12	0.3	2.0					
3	0.07	0.2	0.4	1.35	0.55	0.2			
4	0.06	0.2	0.3	1.2		0.4			
5	0.05			4.0		0.45			Like chrome-moly die steel
				HUB STEELS					
SIS 2260	1.0	0.25	0.5	5.25		1.1		0.2	Through hardening steels
SIS 2310	1.5	0.3	0.45	12.0		0.8		0.2	
SIS 2312	2.05	0.3	0.75	13.0			1.25		

tion, the tensile strength rises while elasticity is reduced.[1]

Fig 2 shows the change of structure in a low-carbon steel (0.1% C) after 40% cold deformation. The Brinell hardness is increased from 120 to 240. Fig 3 shows a section through a hubbed cavity. The advantageous recrystallization is obvious.

It should be mentioned here that a hubbed cavity never cuts through the material fiber as is the case with most machined cavities. This result and the local hardening of stressed areas during hubbing have a beneficial effect on the wearing qualities of the die or mold in many instances.

At this stage the question arises "where does the metal go?" There is no change in volume,[1] ie, no densening of the metal. Thus, the metal must flow upward, downward or radially away from the hub. Radial flow is to a large extent prevented by the chase. Hence, the nib generally increases in length. Because the cavity is usually relatively small in relation to the over-all dimensions of the insert, a small increase in nib length and diameter will account for all the metal displaced in the center.

For deep cavities the OD of the die must be selected carefully. It should not be too large. Sufficient radial pressure must be generated between hub and chase to obtain the necessary deformability. On the other hand, if wall thickness is reduced too much the radial pressure will be excessive and fractures will result. The die diameter should be approximately double the hub diameter or slightly less.[2]

Some people recommend relieving the insert on diameter and base (Fig 3), but others refrain from this practice in almost every case. Similar likes and dislikes exist with respect to intermediate annealing of the die block during the hubbing process. Some users advise this,[3] while others[4] suggest avoidance of the practice because of time taken, effect on surface finish and the tendency to create steps where hubbing was interrupted.

A further controversial point is the pre-machining of cavities. German practice makes use of extensive

pre-machining, especially where forms are deep or complex, and where the cavities have proud projections which must be raised into recesses in the hub. In England pre-machining is less widely used. Some shops employ chase rings and die nibs with relatively steep tapers to create the necessary flow.

An important factor is the design of the chase or retaining ring. Stress conditions similar to those in thick cylinders and shells are present in the chase while hubbing is in progress. Maximum radial and tangential stresses exist in the chase at the contact face between die and chase. While the chase must be extremely tough and of ample proportions, an increase in OD beyond a certain maximum is pointless, because the reduction in stress at the periphery becomes negligible. A value of $D = 4d$ is suggested as a maximum, where D is the outside diameter of the chase and d the inside diameter.[5]

Another matter requiring careful attention is the preparation of the die surface prior to hubbing. The final finish of the cavity depends on this. A highly polished die blank will give a burnished cavity.

The question of suitability of certain materials for hubbing and hubs covers a wide field. Although it is generally understood that deep cavities can be hubbed only into free-flowing steels (special hubbing steels), shallow cavities can readily be hubbed into high-tensile alloy steels. The former application refers in particular to mold work, while the latter covers heading, forging and impact-extrusion dies. Typical analyses of steels for the various applications are given: Table I shows steels of British manufacture,[6] while Table II shows similar steels of Swedish origin.[7]

The low-carbon British steel is most suitable for intricate hubbing. The other steels may be employed for shallow cavities and where conditions demand extra care and experimentation.

Selection of suitable hub steel is of utmost importance. The number of cavities obtainable per hub decides the economy of the process to a large extent. Hub steels must be of the through-hardening type. High-carbon, high-chrome and the high-carbon, high-tungsten steels are in this category.

Pressure formula derived from examples

A simple empirical formula for hubbing pressure is:

$$P = A \times Up$$

where P = Total hubbing pressure (tons)
A = Projected surface area of hub (sq in.)
Up = Specific pressure per unit area (tons/sq in.)

This formula has been in use for some time. Most existing literature on hubbing states that the specific pressure is difficult to determine from anything except experimental data because of the many variables involved in computations.

It is felt that this is not so, and that *hubbing pressures can be predicted* fairly accurately where the ultimate tensile strength of the die steel is known, providing the hubbing is not of excessive depth and that it is reasonably symmetrically disposed. As depth increases, friction plays an increasing part in the build-up of pressure. It is not proposed to cover this contingency here.

On closer study, the empirical values given in Table III show that there is a reasonably close relationship between the ultimate tensile strength and the specific hubbing pressure, and that the ratio between these is around 1:3.

Fig 4 demonstrates this relationship in graphical form. It will be seen that an approximate straight line with slope 1:3.3 can be plotted. Making an arithmetical check by taking the average of all the pressures and strengths, we obtain 149:44.5 = 3.36.

Although the figures are higher than 3:1, it

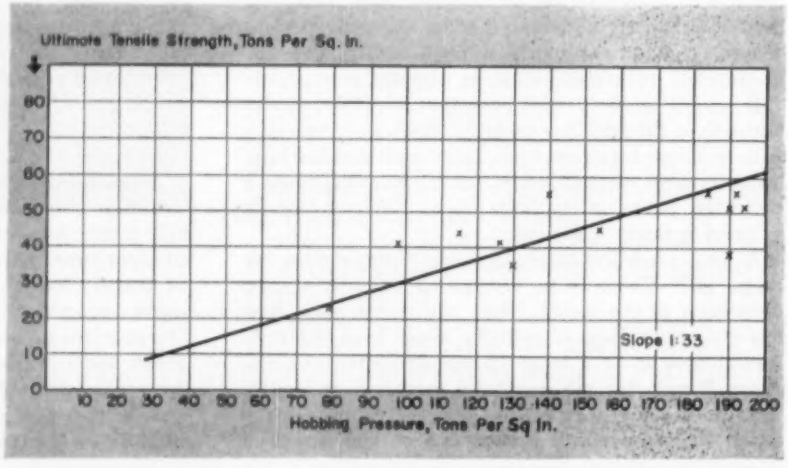


FIG. 4 . . Hubbing pressure is approximately 3 1/3 times the ultimate tensile strength of the steel

must be remembered that allowance for friction has not been made. Bearing this in mind, the figures appear to be reasonable enough to propose that *this ratio is no coincidence.*

THEORETICAL CONSIDERATIONS

The ideas put forward below are based on the assumption that there is a direct relationship between cold hubbing and hardness testing.

In the Brinell test, the hardness number is obtainable by the relation of a fixed load to the spherical area of indentation it creates with a fixed-size indenter.

Brinell hardness number = Constant load divided by spherical area of indentation.

$$\text{BHN} = \frac{2W}{\pi D\ (D - \sqrt{D^2 - d^2}} \qquad \text{(see Fig 5)}$$

where $\pi D \dfrac{D - \sqrt{D^2 - d^2}}{2}$ = Area of indentation in terms of ball-indenter diameter and maximum diameter of indentation.

This is derived as follows (Fig 5):

to find h:

$$h^2 + \frac{d^2}{4} = \frac{D^2}{4}$$

$$h^2 = \frac{D^2}{4} - \frac{d^2}{4}$$

$$h = \frac{\sqrt{D^2 - d^2}}{2}$$

also since $h = \dfrac{D}{2} - n$

$$n = \frac{D}{2} - h$$

therefore: $n = \dfrac{D}{2} - \dfrac{\sqrt{D^2 - d^2}}{2} = \dfrac{D - \sqrt{D^2 - d^2}}{2}$

Area of whole sphere = πD^2

Area of sphere segment = πDh, or in our case πDn

Thus the spherical area of indentation in the Brinell test is $\pi D \dfrac{D - \sqrt{D^2 - d^2}}{2}$

and BHN =

$$\frac{W}{\pi D\left(\dfrac{D - \sqrt{D^2 - d^2}}{2}\right)} = \frac{2W}{\pi D\left(D - \sqrt{D^2 - d^2}\right)}$$

It is a known fact that the BHN has a constant relationship to the ultimate tensile strength of steels. Brinell numbers can be converted to ultimate tensile strength by dividing by 0.33, giving answers in kg/mm², (the Brinell system being a metric one, using metric ball and kg load).

Here again the 1:3 ratio is a salient characteristic. It is this fact which suggests the relationship between cold hubbing and indentation tests.

It might be objected that the table given earlier considers loads in relation to *projected* area. This, however, is acceptable. The derivation of the BHN

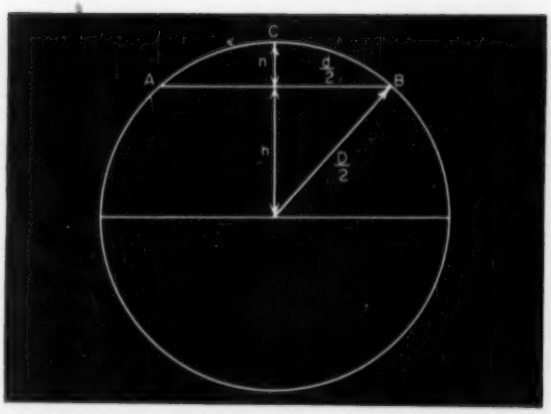


FIG. 5.. Diagram for determination of area of sphere segment in terms of D, the Brinell indenter, and d, the diameter of the impression

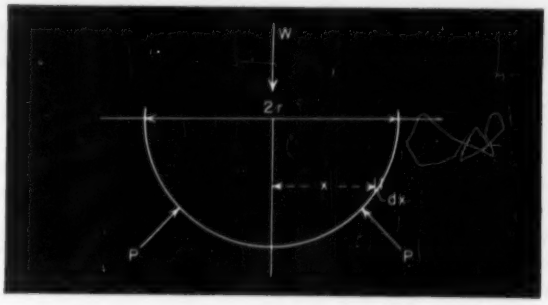


FIG. 6.. Diagram for determination of the load-projected area concept

is not entirely satisfactory since the ratio load to curved area does *not* give the mean pressure over the surface of indentation.[8] Brief study of Fig 6 will establish this:

$$W = \int_0^r P 2\pi x dx$$

$$= P 2\pi \int_0^r x dx$$

$$= P 2\pi \left[\frac{x^2}{2}\right]_0^r$$

$$W = P\pi r^2$$

$$P = \frac{W}{\pi r^2}$$

The above clearly shows that the mean pressure between indenter and indentation is the ratio of load to *projected* area.

This quantity forms the basis of another system of hardness testing, the "Meyer hardness" (1908). The differences between Brinell and Meyer hardness, however, are sufficiently slight (for the purposes of the approximation covered by the author) to be ignored. The instance is quoted only to provide further

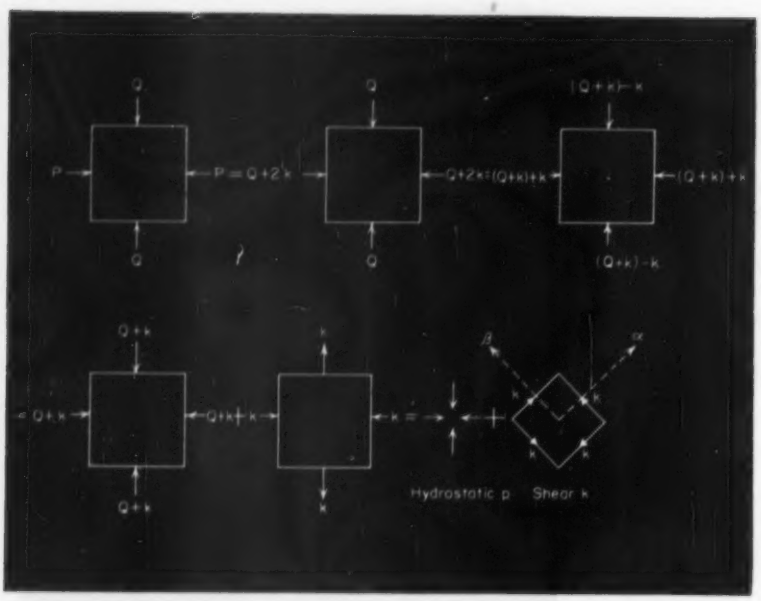


FIG. 7 . . Diagram showing that principal stresses P and Q are replaceable by hydrostatic pressure p and a maximum shear stress k

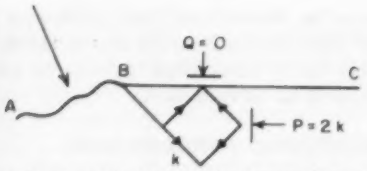


FIG. 8 . . Slip lines at the free surface of plastically deformed metal occur at an angle of 45°

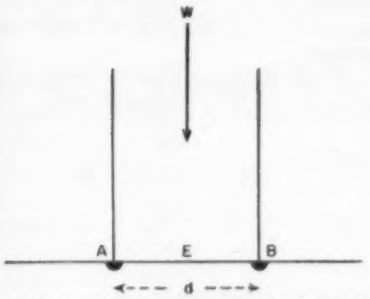


FIG. 9 . . Diagram showing plane strain of an ideal plastic metal deformed by a flat punch

justification for using the "projected area" concept.

Although this discourse has progressed some way towards providing evidence substantiating the findings in Table III and the relationship between hubbing pressures and ultimate tensile strength, it is felt that the plasticity aspect and the *reason* for the 1:3 ultimate tensile strength—hubbing pressure ratio—should be investigated.

Dr. D Tabor[9] in his book, *"The Hardness of Metals"* (1951), provides excellent data on plastic deformation under combined stresses:

"When an indenter is pressed on to a surface, the stresses are not simple tensile or compressive stresses. Stresses in various directions are set up, and we must therefore consider the conditions for plastic flow under combined stresses. One experimental clue to the behavior of metals under these conditions is the observation that a hydrostatic pressure will not of itself produce plastic deformation. We may therefore expect that if a metal is subjected to combined stresses, the only part of the stresses which will be effective in producing plastic deformation will be the part left after the hydrostatic component has been subtracted. Suppose a metal is subjected to combined stresses in which the principal stresses are p_1, p_2, p_3. We may consider that this is equivalent to the sum of a hydrostatic component $1/3\ (p_1 + p_2 + p_3)$ and reduced stresses $p_1 - 1/3\ (p_1 + p_2 + p_3)$, $p_2 - 1/3\ (p_1 + p_2 + p_3)$ and $p_3 - 1/3\ (p_1 + p_2 + p_3)$.

The hydrostatic component plays no part in the plastic deformation of the metal. Only the reduced stresses are responsible for producing plastic deformation, and it is found *experimentally* that this occurs when $[p_1 - 1/3(p_1 + p_2 + p_3)]^2 + [p_2 - 1/3(p_1 + p_2 + p_3)]^2 + [p_3 - 1/3(p_1 + p_2 + p_3)]^2 =$ constant or

$$1/3\ [(p_1 - p_2)^2 + (p_2 - p_3)^2 + (p_3 - p_1)^2] = \text{constant} \qquad (1)$$

For uni-axial tension (or compression) $p_2 = p_3 = 0$, and plastic deformation occurs when the axial stress equals the yield stress Y, ie, when $p_1 = Y$. This makes the value of the constant equal $2/3Y^2$, so that equation (1) becomes

$$(p_1 - p_3)^2 + (p_2 - p_3)^2 + (p_3 - p_1)^2 = 2\ Y^2 \qquad (2)$$

This expression was originally derived by Huber (1904) and independently by von Mises (1913) from more general conditions for plastic deformation. The relation is known as the Huber-Mises criterion of plasticity and is supported by a very large body of experimental data.

"In the case of two-dimensional deformation or plane strain, it may be shown that the condition for zero plastic deformation in the direction of p_2 is that $p_2 = \frac{1}{2}(p_1 + p_3)$. Substituting this value for p_2 in equation (2), the Huber-Mises criterion becomes

$$p_1 - p_3 = \frac{2}{\sqrt{3}}\ Y = 1.15\ Y$$

Thus the condition for plasticity is a maximum shear stress."

Let us continue with the assumption that plastic flow occurs when the Huber-Mises criterion is satisfied. In two-dimensional flow this occurs when the maximum shear stress reaches a critical value k where $2k = 1.15\ Y$.

We shall now show that at any point where plastic deformation occurs the total stresses can be represented by the sum of a hydrostatic pressure p and a shear stress k where k has the value given above. We consider any two-dimensional element which is subjected to principal (orthogonal) compressive stresses P and Q. (See Fig 7.)

These stresses completely define the stress condi-

tions on the element. The maximum shear stress produced is at 45° to P and Q and has a magnitude $\frac{1}{2}(P - Q)$. We know that, if the material in this element is flowing plastically, the maximum shear stress has reached a critical value which we put equal to k, and $2k = 1.15\ Y$, according to Huber-Mises.

If $k = \frac{1}{2}(P - Q)$, $P = Q + 2k$. We may thus replace the principal stresses by Q and $Q + 2k$. These may be written respectively as $(Q + k) - k$ and $(Q + k) + k$. The first term in each stress constitutes a hydrostatic pressure $p = Q + k$. The second terms involving a compression k and a tension k are equivalent to a pair of orthogonal shear stresses k at 45° to the direction of P and Q (see Fig 7). Thus, when plastic deformation occurs, the stresses at any point may be expressed in terms of a shear stress k plus a hydrostatic pressure p, where k is constant while p may vary from point to point. The lines of maximum shear stress k are called slip lines, but they must not be confused with slip lines or bands observed under the microscope. The whole domain of plastic flow may be covered by two families of slip lines, the α and β curves, each of which cuts the other orthogonally. If the hydrostatic pressure at any point is known, we may at once deduce the principal stresses, since

$$P = p + k$$
$$Q = p - k$$

A detailed treatment shows (Henky 1923; Hill, Lee and Tupper 1947) that if the slip lines are straight lines, p is constant throughout the plastic region. If, however, there is any curvature of a slip line by an angle ϕ relative to a fixed direction (ϕ positive when moving anti-clockwise), then:

$p + 2k\phi$ = constant along an α line

$p - 2k\phi$ = constant along a β line

This was first derived by Henky (1923) from considerations of the equilibrium of an element. The value of the constant is determined by the boundary conditions.

Consider a simple application of the slip-line theory. Suppose a metal is deformed over a region AB and as a result plastic flow also occurs in the material under the free surface BC (Fig 8). As there must be no tangential force at the free surface, the slip lines at the free surface must make an angle of 45° with it. The resultant normal stress at the surface must also be zero, ie, $Q = 0$. Hence $Q = p - k = 0$ or $p = k$ and $P = p + k = 2k$. This means that at the free surface there is a hydrostatic pressure $p = k$, and a maximum shear stress k. In terms of the principal stresses we may say that the normal stress $Q = 0$, while the transverse compressive stress $P = 2k$. Similarly the slip lines must make an angle of 45° at the common surface of contact if there is no frictional force, because there can be no resultant tangential force at the interface.

Now let us consider the deformation of an "ideal" plastic metal by a flat punch of infinite length and uniform width d, (Fig 9). Assume that the punch is undeformable and there is negligible friction. Even for the smallest applied loads the metal at A and B will be in a state of incipient plasticity (sharp edges creating infinite shear stresses at smallest load). At other parts of the metal, the conditions are insufficient to create plastic flow. As the punch load is increased, the region of plasticity increases in size until finally the whole of the material around the punch becomes plastic and the indenter (hub) begins to penetrate the metal on a relatively large scale.

The determination of the *pressure on the face of the punch* when this occurs was first derived by Prandtl (1950) and we may indicate how this may be obtained by the method of slip lines.

It may be shown that the slip-line pattern which satisfies the plastic equations and the boundary conditions for stress and displacement is of the form shown in Fig 10. The four isosceles triangles CMA, ANE, ESB and BTG represent domains in which the slip lines are straight lines making an angle of 45° with the free face of the metal and the punch. The triangles on either side of the punch are connected to those beneath the punch by curved slip lines which are areas of circles with A and B as centers. The slip lines orthogonal to these are the straight lines radiating from A and B. The region in which the material is flowing plastically is defined by the boundary *CMDNESFTGC*. We may now follow a typical α slip line starting at the point G_1. As we saw above, since the normal principal stress at this point is $Q = 0$, $p = k$. Consequently, the equation along this slip line may be written

$$p + 2k\phi = k$$

where ϕ is the deviation of the slip line from the direction G_1T_1. Along G_1T_1 there is no change in the value of p because G_1T_1 is a straight line. At T_1, however, the slip line begins to curve until the point S_1 is reached. The slip line has now turned through an angle $\phi = -\frac{1}{2}\pi$, so that for the point S_1 we may write

$$p - 2k\tfrac{1}{2}\pi = k$$

No further change occurs in the value of ϕ as the slip line is traversed from the point S_1 to the point E_1, so that at E_1

$$p = k + 2k\tfrac{1}{2}\pi$$

We now determine the principal stresses at E_1. The stress normal to the surface, which is now P is given

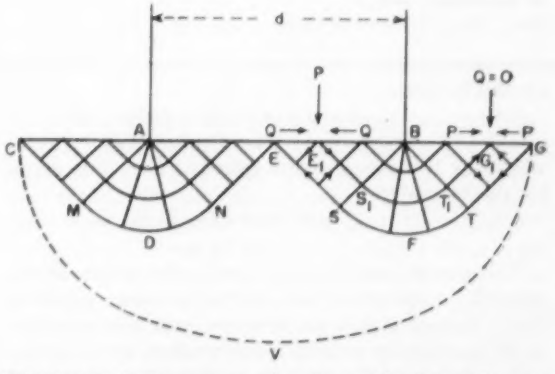
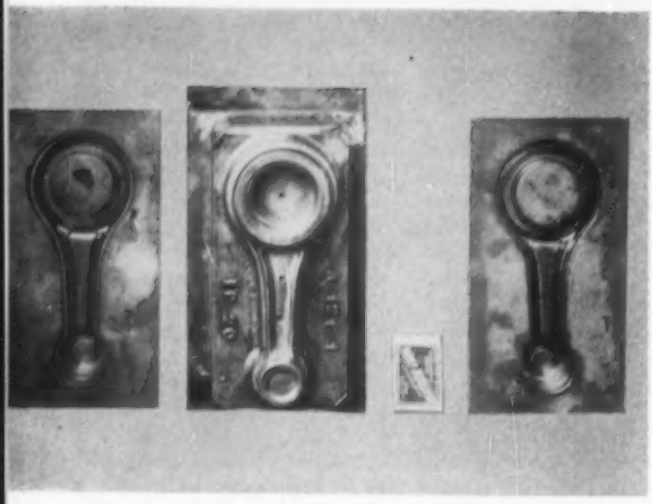


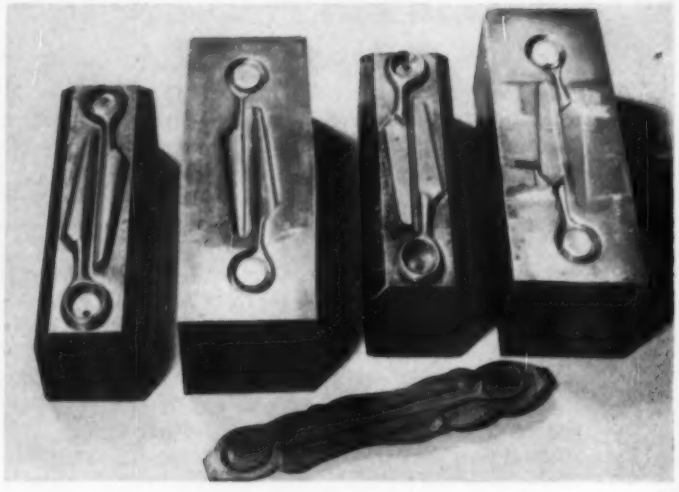
FIG. 10.. Slip-line pattern when large-scale deformation occurs. Plane strain (Hill, 1950)

How to Figure HUBBING PRESSURE AND COST . . .

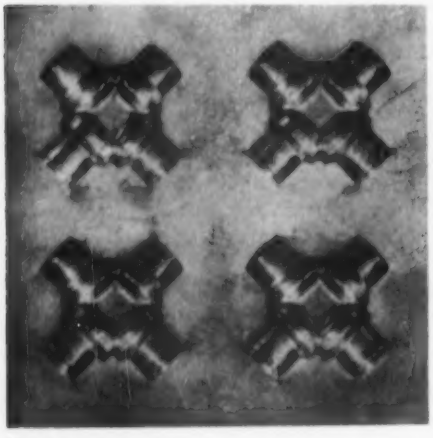
Typical Examples of Hubbed Dies



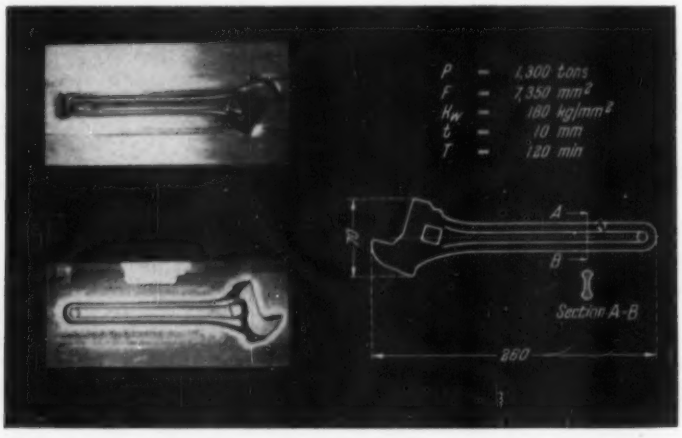
1 . . Connecting-rod forging die is a relatively shallow hubbing with raised bosses. Material: high-tensile steel



2 . . Two scissors dies. *Left*—upper part hubbed without a chase into a flat surface. *Right*—lower part hubbed into blank with raised surface, but no chase was used



3 . . Universal joint requires a shallow cavity in high-tensile steel



4 . . Adjustable wrench involves hubbing considerable detail into tough steel

by the formula:

$$p = p + k = (k + 2k\tfrac{1}{2}\pi) + k$$
$$= 2k(1 + \tfrac{1}{2}\pi)$$

while the transverse stress which is now Q is given by the formula:

$$Q = p - k = (k + 2k\tfrac{1}{2}\pi) - k$$
$$= 2k\tfrac{1}{2}\pi$$

This means that the metal under the punch at the point E_1 is subjected to a normal pressure equal to $2k\ (1 + \tfrac{1}{2}\pi)$ and to a transverse compressive stress of $2k\tfrac{1}{2}\pi$. Similar treatment shows that the same result is obtained for all points along the surface of the punch. Consequently, the normal pressure P is uniform over the face of the punch and is given by

$$P = 2k\ (1 + \tfrac{1}{2}\pi)$$

According to the Huber-Mises criterion mentioned earlier $2k = 1.15\ Y$.

Thus, in general, full-scale plastic flow and consequent indentation occur when the pressure P_m across the face of the punch is given by

$$P_m = 1.15\ Y\left(1 + \frac{\pi}{2}\right) \sim 3\ Y$$

Thus, Dr Tabor's work both proves that the assumption of the ratio ultimate tensile strength/hub-

and Molds

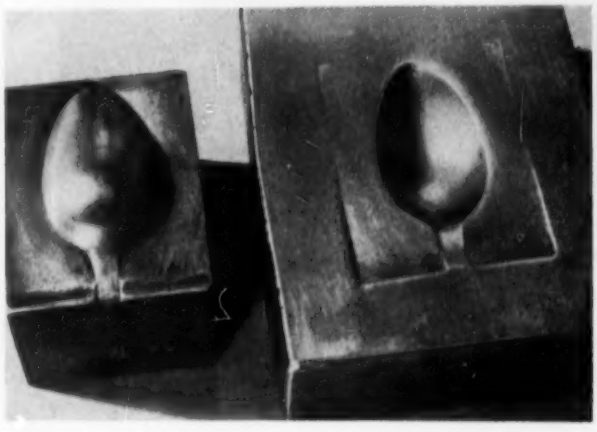
(See page 159 for cost data)

5. . Header die for track bolt was made in a chase. A relief ridge was used around the periphery of the nib

table III . . PRESSURES FOR PRODUCING ILLUSTRATED EXAMPLES OH HUBBED DIES AND MOLDS

Example	Total pressure, tons	Die steel U.T.S. tons/sq in.	Hubbed area, sq in.	Pressure per sq in., tons	Hubbed depth, in.
1	1650	55	8.6	192	½
2	460	41	4.7	98	¼
3	2000	55	14.26	140	⅞
4	1300	44	11.33	115	⅜
5	500	45	3.25	154	1½
6	700	51	3.6	194	⅝
7	450	51	2.3	190	⅝
8	40	41	0.32	125	¼
9	220	35	1.7	130	⅝
10	930	23	11.7	79	2¼

6. . Fine detail and high surface finish were obtained in a knife-handle die



7. . No chase was required when producing this spoon die

MORE EXAMPLES ON NEXT PAGE

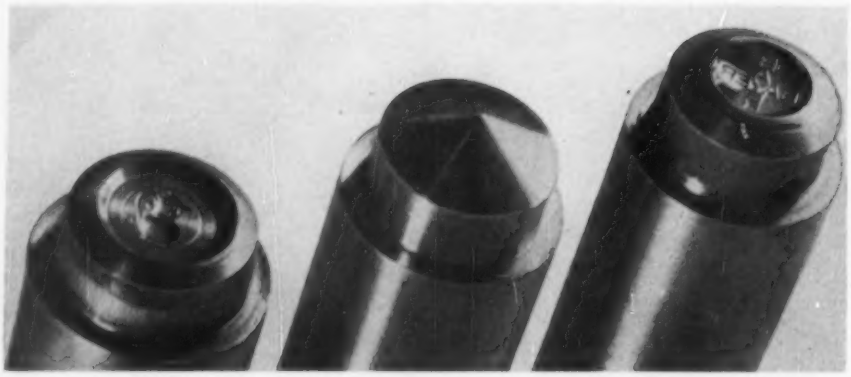
bing pressure = 1:3 is acceptable under certain near ideal conditions and shows the reasons why this is so.

It must be stressed, however, that the relationship is: (a) approximate only, (b) holds good only for symmetrical cavities which are relatively shallow, and (c) makes no allowance for friction. Nevertheless, the relation forms a valuable guide when assessing requirements for hubbing applications, and safety margins can be added on the basis of experience.

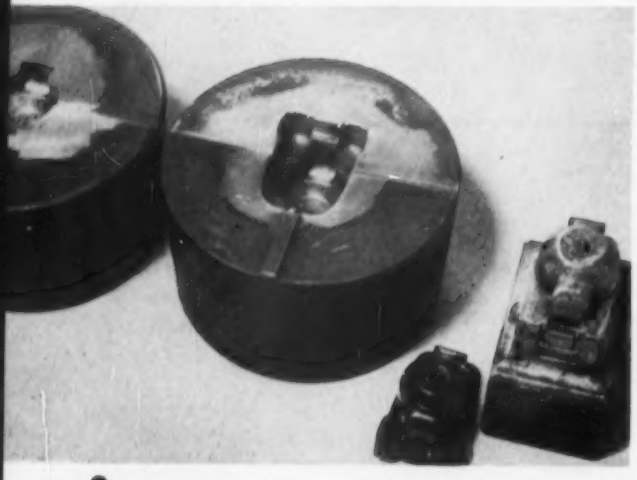
Before approaching another aspect of hubbing practice, there should be some explanation why the term "yield stress" is used throughout the above data, when the point at issue concerns itself with the ultimate tensile strength of the materials being hubbed. The theoretical considerations, however, deal with an "ideal" plastic metal. It is known that the "true" stress characteristics and the "nominal" stress characteristics are at variance. "Nominal" stress-strain curves do *not* consider reductions in specimen cross-sectional area as the test proceeds.

In the case of an "ideal" plastic metal the maximum tensile stress is very close to the initial yield stress when considering the "true" stress characteristics—whence the use of the term "yield stress".

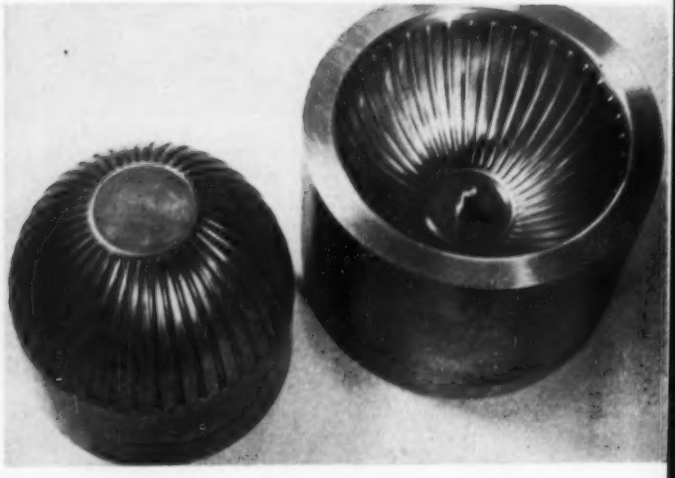
Typical Examples of Hubbed Dies and Molds . . .
continued



8 . . Tablet dies with raised initials are hubbed in a chase



9 . . Switch-part mold was produced in two stages: *left*—into a flat surface, *center*—step was machined into surface to allow for asymmetrical disposition of the mold contour. A chase was employed



10 . . Mold for a ball float had the cavity pre-machined, then hubbed

Cost studies show economy of hubbing

The ground covered so far has shown some of the "hows" and "whys" of hubbing, but the all-important factor for the practical engineer, cost, has been left to last.

This was done purposely. A picture will have formed at this stage of a process requiring expensive capital equipment and presenting much uncertainty as to the possible success of an installation. The latter point may be somewhat discouraging in view of the lack of concrete data on technique entailing much experiment by trial and error.

To relieve this aspect, let there be some quotations of savings possible once the feasibility of cold hubbing is established. It is proposed to quote costs of

more conventional methods against cold hubbing.

The examples include three dies mentioned earlier and one other specimen. The details given are the actual practical findings. The figures given are, however, simplified for convenience and since the examples are from Continental sources, costs were converted into dollars, not at the ruling exchange rate but a rate giving a sensible comparison.

Connecting-Rod Forging Die

When produced by machining, the costs of one die are:

Master model	$ 30.00
Copy milling	$ 450.00
	$ 480.00

When produced by hubbing, the costs of one die are:

Hub	$ 180.00
Hubbing	$ 39.00
	$ 219.00

Thus, even the first die shows that machining costs approximately 120% more than hubbing.

If one hub is capable of producing ten impressions, the comparison becomes still more favorable.

When produced by machining, the costs of ten dies are:

Master model	$ 30.00
Copy milling	$4500.00
	$4530.00

When produced by hubbing, the cost of ten dies are:

Hub	$ 180.00
Hubbing	$ 390.00
	$ 570.00

Thus, if ten cavities are produced from one hub, machining costs exceed hubbing costs by approximately 700%.

Universal-Joint Die

When produced by machining, the costs of one die are:

Master model	$ 15.00
Copy milling	$ 450.00
	$ 465.00

When produced by hubbing, the costs of one die are:

Hub	$ 90.00
Hubbing	$ 69.00
	$ 159.00

Thus, even the first die shows that machining costs approximately 192% more than hubbing.

If one hub is capable of producing ten impressions, the comparison becomes yet more favorable.

When produced by machining, the costs of ten dies are:

Master model	$ 15.00
Copy milling	$4500.00
	$4515.00

When produced by hubbing, the costs of ten dies are:

Hub	$ 90.00
Hubbing	$ 690.00
	$ 780.00

Thus, if ten cavities are produced from one hub, machining costs exceed hubbing costs by approximately 475%.

Adjustable-Wrench Die

When produced by machining, the costs of one die are:

Master model	$ 42.00
Copy milling	$ 456.00
	$ 498.00

When produced by hubbing, the costs of one die are:

2 hubs	$ 360.00
Hubbing	$ 39.00
	$ 399.00

Thus, the first die shows that machining costs exceed hubbing costs by only 25%. The reason for this is, of course, the fact that the two hubs cost nearly as much as copy milling.

If the hubs are used to produce ten impressions, the comparison shows great advantage due to the low hubbing cost of this particular die.

When produced by machining, the costs of ten dies are:

Master model	$ 42.00
Copy milling	$4560.00
	$4602.00

When produced by hubbing, the costs of ten dies are:

2 hubs	$ 360.00
Hubbing	$ 399.00
	$ 759.00

Thus, if ten cavities are produced from one set of hubs, machining costs exceed hubbing costs by approximately 505%.

Hexagonal-Bolt Heading Die
(1 in. across the flats.)

When produced by old method, the costs of one die are:

Turning	$ 1.50
Producing blind hexagon manually	$ 42.00
	$ 43.50

When produced by hubbing, the costs of one die are:

Hub	$ 24.00
Pre-turning	$ 1.00
Hubbing	$ 1.50
	$ 26.50

Thus, the first die off shows machining costs 64% in excess of hubbing.

Hubbings of this type are common in the nut and bolt industry. The reason for this becomes obvious when investigating the enormous savings possible if one hub is used for a large number of impressions. For this type of work, hubs show extremely long

life, or frequently up to 100 impressions per hub.

Let us take ten impressions first and study the costs:

Turning and manual production of blind hexagon (10 x $43.50)	$ 435.00
Hub	$ 24.00
Turning and hubbing (10 x $2.50)	$ 25.00
	$ 49.00

The example at this stage shows that machining costs exceed hubbing costs by approximately 780%.

Now assume that 100 impressions are possible from one hub:

Turning and manual production of blind hexagon (100 x $43.50)	$4350.00
Hub	$ 24.00
Turning and hubbing (100 x $2.50)	$ 250.00
	$ 274.00

Machining costs now exceed hubbing costs by approximately 1500%.

The above four examples provide an illuminating survey. It is obvious that the savings possible form a sound justification for seriously considering the hubbing technique. It should also be borne in mind that all the examples quoted are cases where high-tensile steels were hubbed. The savings when the free-flowing, so called "hubbing steels" are employable are, of course, still higher.

There are numerous instances where present methods utilize die steels which do not readily lend themselves for hubbing purposes. Employment of somewhat more ductile steels may overcome this difficulty. The objection that dies made from such softer steels will not have the same life can be countered firstly by the fact that hubbed dies, although in softer steels, often show improved characteristics at the wearing faces, and, secondly, by the fact that the vastly reduced cost of manufacturing hubbed dies may more than offset the greater number of dies required, as well as the increased resetting times.

Lastly, on the issue of economics, let it be said that there are many die forms which cannot be produced by any method other than cold hubbing unless they are built up from sections. This latter method of die manufacture is very costly, and hubbing provides a far better, if not the only, answer. Many such instances can be found and this condition also applies in almost all cases where proud projections are required at the base of the cavity.

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REFERENCES

1. Dr Ing K Schimz VDEh VDI, Das Kalteinsenken von Werkzeugen, "Draht", Vol 8, '52, p3, Prost Meiner Verlag, 13a Coburg/Ofr.

2. W Haufe & E Buerklin, Die Herstellung von Pressgesenken auf dem Wege der spanlosen Formung durch Kalteinsenken. "Technische Zeitung fuer praktische Metallbearbetung", No. 17/20, '35, p3, Technologischer Verlag Berlin Halensee.

3. Ing H Schlippes VDI, Stahltechnologische Fragen des Kalteinsenkens in Formenbau, "Kunststoffe", May, '54, p151, J H Lehmanns Verlag, Muenchen.

4. W A Thompson, Cold hobbing of mould and die cavities, "Machinery", reprint, Machinery Publishing Co Ltd, London. 1954.

5. K Sieber VDI, Stresses, construction, manufacture and life or cold flow pressing of steel, "Draht", March, '53, p32, Prost und Meiner Verlag, 13a Coburg/Ofr

6. Analyses by permission of Messrs Edgar Allen & Co Ltd, Imperial Steel Works, Sheffield 9, England.

7. Berging G Folke, Stahltechnologische Fragen beim Kalteinsenken von Presswerkzeugen fuer Kunststoffe, "Kunststoffe", Vol 9, '54, p394, Carl Hauser Verlag GMBH, Muenchen.

8. D Tabor Ph D, The physical meaning of indentation hardness, "Sheet Metal Industries", Nov, '54, p753, Industrial Newspapers Ltd, London.

9. D Tabor Ph D, The hardness of metals, monographs on ths physics and chemistry of materials, p28 to 37, The Clarendon Press, Oxford, 1951.

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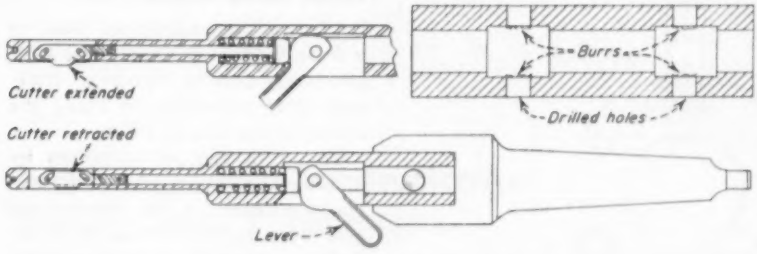
Practical Ideas . . .



Internal Deburring Simplified

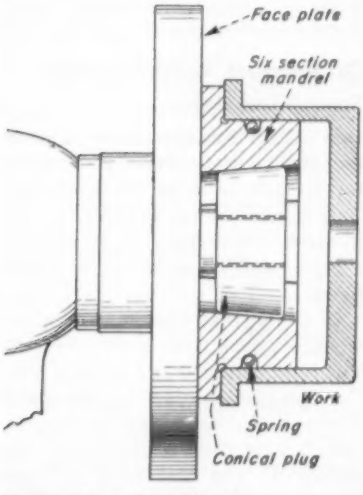
Having experienced trouble in internally deburring a component by hand with special scrapers, I designed the illustrated deburring tool. The fact that the holes could not be drilled before the bore was completed with a honed finish, is what posed the difficulty. Therefore, hand scraping was ruled out because of the danger of scratching the bore.

This tool has performed well without that disadvantage, and is simple to operate.

With the cutting blade retracted, tool is inserted into the bore to a predetermined depth. This places the cutter near the location of the holes. Cam lever is depressed, moving blade out horizontally. Feeding forward and back slightly will remove any remaining burrs. Flick back lever to retract cutter and remove tool from the bore.

The tool consists of the following: A removable shank, enabling the operator to use it either by hand or power; a central spring-loaded plunger which is actuated by the lever; a link connecting plunger to a double-edge toolbit previously referred to as the cutter blade, with opposed slots for pivot pins.

G O Everett, Colchester, England



Expansion Mandrel Holds Work Concentric

Everyone who has had the opportunity to use an expansion mandrel knows how valuable they are in production work and how easy they are to operate.

We have at the present time a large job lot of aluminum castings. They are first held in an ordinary chuck, where we do the facing, inside diameter, boring of a small hole, and bottom facing. They are then held on the mandrel for the final outside machining.

The mandrel consists of a faceplate with a guide hole ground to finished size after case-hardened plate is mounted on spindle. The face of the plate should also be ground at this time. The expanding part is machined to fit I D of casting, and a tapered hole to take the plug is bored at the same setting, as well as a landing face with corner clearance. A groove must be cut for the holding spring, slightly deeper and wider than the O D of the spring. After all machining is done, it is cut into six sections.

A drawbar runs through spindle and the hole of the faceplate. A conical plug, with a taper matching the mandrel, is screwed onto the drawbar. We use a lever at the back end of the spindle, but a handwheel can also be used here.

The six segments are placed around the drawbar plug, and the spring with its ends hooked together is placed in the groove to hold the segments.

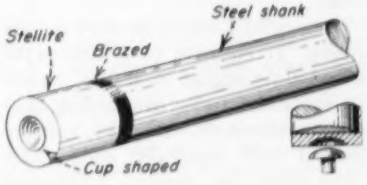
Clifford Molloy, New York N Y

Chip Remover Saves Files

Chips imbedded between the teeth of a file can be pretty stubborn, and often refuse to be budged by a file card. Many men will therefore resort to using a scriber to dig them out. This should be avoided, for it may ruin the file and certainly will not do the scriber any good. It's also a slow and tedious job to pick one chip at a time.

I have for years been using a piece of copper tubing, flattened at one end, to rub over the file. This removes the chips with little effort and does not harm the file in any way. The copper, being soft, will adapt itself to the contours of any size teeth.

Harold Burdett, Tacoma, Wash



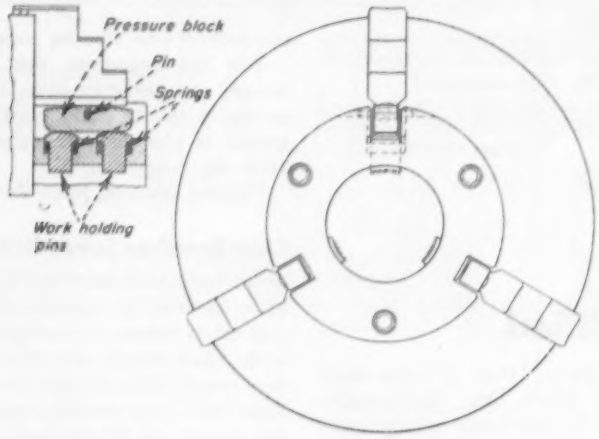
Stellite Tip Does Fine Rivetting Job

We had the job of rivetting thin cast-iron plates to a steel plate. In trying to upset the rivets in the usual way we experienced some trouble, so the following method was used.

A piece of Stellite was brazed onto a steel shank. After truing the shank in the lathe, a cup form was ground in the Stellite, corresponding to the shape of a rivet head.

This tool was used in a powerful drillpress run at 3000 rpm. When it was brought down on the end of a rivet the friction heated it to a bright red and squashed it down in a matter of seconds. As the rivet cooled it pulled tight.

Jack Finlay, Blue Mountain, N S W, Australia



Special Jaws Hold Tapered Work

We had a number of forgings to machine in our turret lathe, but had difficulty in holding them because the end that had to be chucked was tapered. These forgings are tapered as a result of the draft in the die. The draft varies a little from piece to piece, so to grind the chuck jaws to suit the taper would not have been practical.

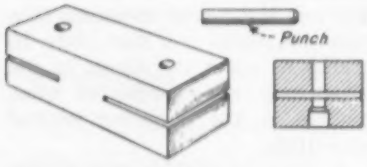
A special fixture, as shown, was made. It consists of a ring with three slots milled in it 120° apart. In each slot holes are drilled and counterbored to take two spring-loaded and hardened pins. The pins back up against a pivoted block on which the jaws bear.

These blocks are held in place by cross pins, going through an elongated hole in each block. The back of the blocks are formed to permit them to rock on the chuck jaws.

The heads of the work-holding pins are slightly rounded to allow free movement of the blocks upon them without binding. A spring under each head keeps them retracted, permitting loading of work without excessive opening of the chuck.

The whole fixture is bolted onto the face of the three-jaw universal chuck with the jaws in line with the slots in the ring.

Clifford Molloy, Bronx, N Y



Simple Punch Block Is Handy Tool

A punch block like the one illustrated can be a worth-while tool in your tool box or bench drawer. This is true particularly when it comes to making a small hole for a screw or a rivet in such tough material as spring steel.

The block is simply a 3-in. length of ¾x1-in. cold-rolled steel. Two slots are bandsawed into it, one from each end. If a better finish is desired in the slots, a slitting saw will do it. A pair of holes is drilled and reamed to the most commonly used sizes. In our case we use ⅛-in. and 3/16-in.

This idea can, of course, be expanded in that the block may be made wider, and several holes of different sizes drilled. It can also be made more durable by using tool steel in its construction, making hardening possible.

Punches can be made from long commercial dowel pins or shanks of discarded high-speed-steel drills. One hard blow with a hammer will usually be enough to pierce a nice clean hole, or a vise can be used as a press to supply the power.

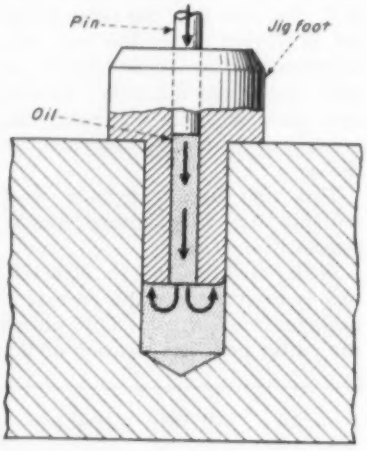
Buckley Sullivan, Cleveland, Ohio

Turret-Lathe Repair Hint

Replacing the preselector head on a Warner-Swasey turret lathe after overhaul usually involves trial-and-error procedure to guide the shifter-arms into position.

This task can be simplified by drilling and tapping a ¾-in. hole (later plugged) in the front of the gear box, directly in line with the shifter-arm position. This provides both visual and mechanical access to the shifter arm during reassembly, which is easily guided into position on the first attempt.

Harry J Miller, Sarasota, Fla



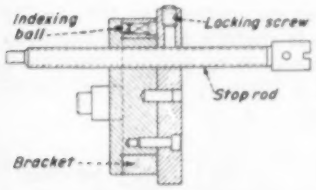
Oil Pressure Removes Parts From Blind Holes

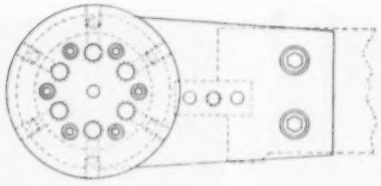
One of the first principles of good tool design is to make it possible for all details to be disassembled. This is not always feasible, as for instance, when jig feet or similar details must be mounted in blind holes.

It is for that reason, whenever we are faced with a situation of this kind, we drill and ream a hole through the center of the part. When the time comes to remove such a part from a blind hole, we simply fill the hole with oil, and insert a drift pin in the hole. This pin should have a working fit in the hole i.e., not too snug, and not too loose.

By forcing the pin into the hole, oil pressure is built up in the confined area under the part to be removed, forcing it out hydraulically.

A M Missbach, Indianapolis, Ind

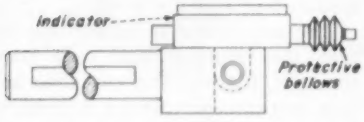




Indexing Stop For Indicator Holds Close Tolerances

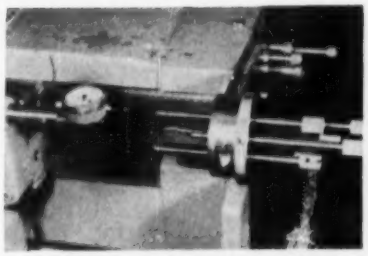
A number of jobs in our shop call for close tolerances on the length of turns and depth of bores in our number 5 Gisholts.

I had this indexing stop made to mount on the end of the ram. The adjustable stop-rods bear on a dial indicator, mounted at the end of a bar, and held in the hole provided for the operating lever of the turret screw-threading attachment.



The mounting bracket is ground finished on both sides, after which it is bored to receive the index body. A hole is drilled and tapped for the locator ball, spring, and setscrew at the exact same radius as the six equally spaced ball sockets in the forward flange.

The index body consists of two parts held together by six socket-head capscrews, and a centrally located dowel. The forward part is

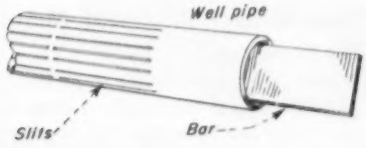


machined to fit the bore in the bracket, holding all measurement close to avoid unwanted looseness. Holes located between the bolts, are drilled and tapped through the index body to receive the adjustable stop-rods. Provisions for locking the rods is made by installing setscrews on top of short lengths of brass rod, entered from the periphery of the rear flange into the rod holes.

In addition to the two bolts securing the stop to the ram, a key is provided to maintain alignment.

This stop has cut our scrap loss to a minimum, and is in daily use by all our operators.

Ed Heim, Minneapolis, Minn



Steel Plate Catches Slag

We are often called on to cut slits in pipe used in sinking water wells The bottom section of the well pipe is the one we convert to a water screen. It has more than 90 slits in it.

Because of the amount of cuts, we burn them out with an oxy-acetylene torch. This used to be a mess, for the slag would be blown across to the opposite inside wall of the pipe and stick there, and sometime fill the slits previously cut.

We have eliminated this effect by using a slag catcher, which is nothing more than a ¼-in. steel plate a bit narrower than the I D of the pipe. It is placed inside the pipe, facing the slit to be cut, so it will block flying bits of molten metal. Most of the slag will adhere to the plate and is easily knocked off after plate is pulled out.

After slits have been completed, the plate can be used to scrape off slag burrs inside the pipe.

Stanley Clark, East Bradenton, Fla

Winners No. 255

won $25 in addition to regular payment for their ideas:

A Vetch
Gage Checks Tapers

Ph E McCafferty
Chamfer Without Extra Step

In the issue of July 16, 1956

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

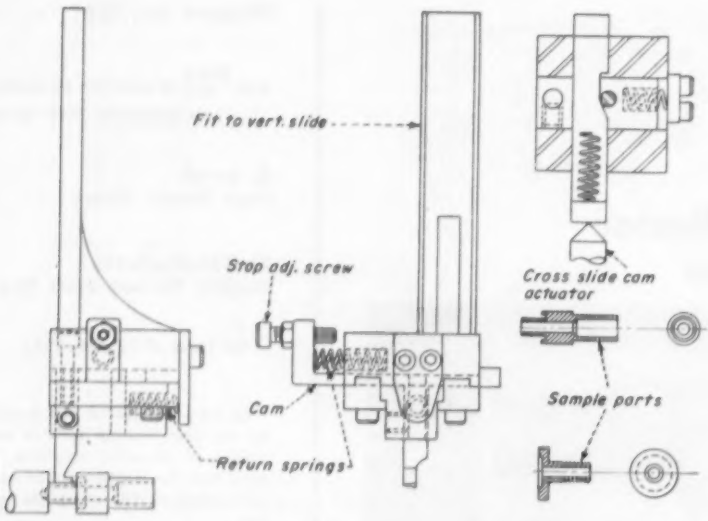
PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y



Recessing Toolholder For Automatics

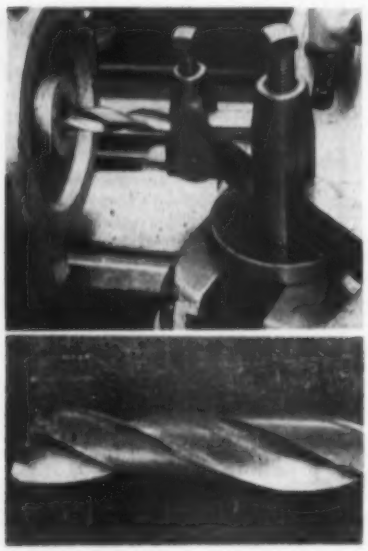
Parts having recesses or counterbores on the reverse end can be economically produced with this toolholder. It is held in the vertical slide of a Brown and Sharpe automatic, and is operated by the cross-slide. These holders can be designed either for single-purpose operations or to include a variety of similar jobs.

Holder consists of main body with a beveled edge shank to fit the vertical slide. The lower part is the tool-slide, carrying a round HSS drill blank used as toolbit. A cross-slide cam with a rise angle of 22½° rides between the two parts, operating the slide through pressure exerted on the cam pin.

Return springs are provided on the tool-slide and cam, and should be only stiff enough to return both without binding. A stop-screw is used to permit adjustment of the length of cam stroke.

Samples of work shown were produced complete in one cycle. In the case of the lower part, the drill for the hole performs the cut-off operation.

Paul W Kutschera, West Allis, Wisconsin



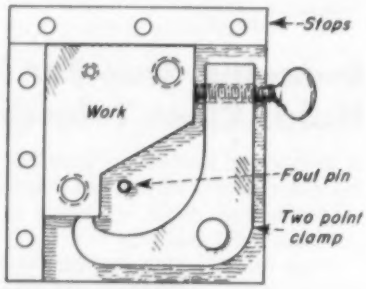
Twist Drill Serves As Boring Bar

A common high-speed-steel twist drill can easily be converted into an efficient boring bar. It is primarily a substitute boring bar for small holes (⅛-in. to ⅜-in.) when a really small bar is not available.

The drill point is ground as illustrated with a slight radius on the leading flute, while the other flute is backed off and is not used. The helix angle of the flute provides a ready-made rake angle for the boring lip, and in its original state is ideal for use on aluminum. When used on steel and cast-iron it should be flattened somewhat, as shown, to create a stronger cutting edge.

It can be held in a standard toolpost boring-bar holder. The bit should be inclined so the cutting edge is slightly ahead of the body of the drill to provide clearance.

H J Gerber, Stillwater, Oklahoma



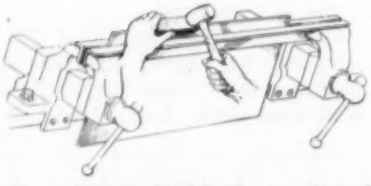
Two-Point Clamp Improves Fixture

We have replaced the usual clamping devices, wherever practicable, in our jigs and fixtures with this double-acting clamp, which can be modified to suit the piece.

The advantage of this clamp is that the operator has only one screw to tighten, and can then be sure that the workpiece is definitely against the stops when properly located.

A foul pin is located in such a position as to prevent error in placing the work in the jig.

Ben Drolet, Drummondville, Que



Two Vises Hold Sheet Metal For Bending

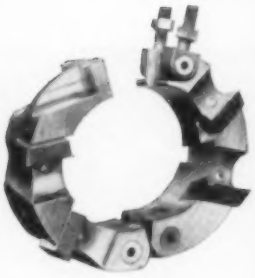
When a metal sheet has to be bent, and one vise is too small to hold it, two vises can be employed, together with two lengths of heavy angle iron.

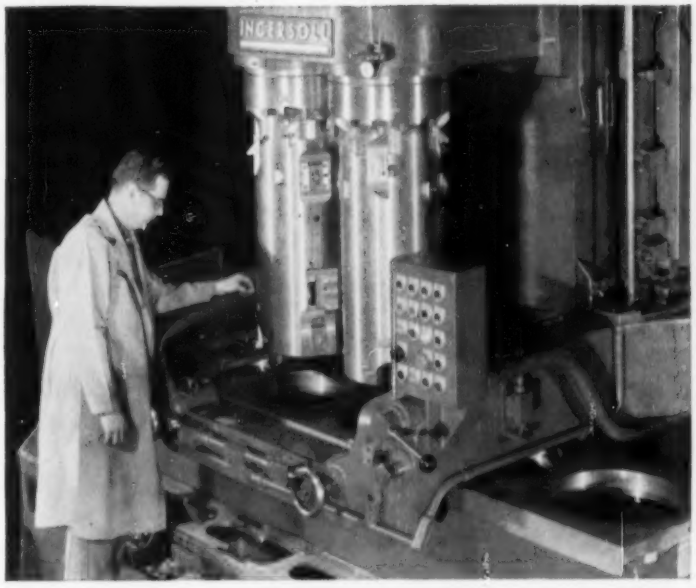
The angles bridge the two vises, as shown, and the sheet is inserted between them. The vises are then tightened to hold the sheet secure.

Bending can be done in either direction, using a block of wood and a mallet to bend the sheet.

The two vises must be in line with each other.

Federico Strasser, Santiago, Chile





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GEAR TOOLING—IV

GLENN TINKLE, gear engineer, ILLINOIS TOOL WORKS, CHICAGO

Optional Features of Gear-Tooth Form

TIP RELIEF

Gears are subject to working tolerances. Involute profile, spacing, helical lead and pitch-line runout rarely coincide exactly with the theoretical dimensions. Moreover, gear teeth deflect differently, depending upon transmitted loads, alignment of bearings, and shaft deflections.

Working contact at the top of a tooth may cause scoring or scuffing on the flanks of teeth of the mating gear. If this mating gear is the driver of the pair, flank damage is especially likely and gear noise often results.

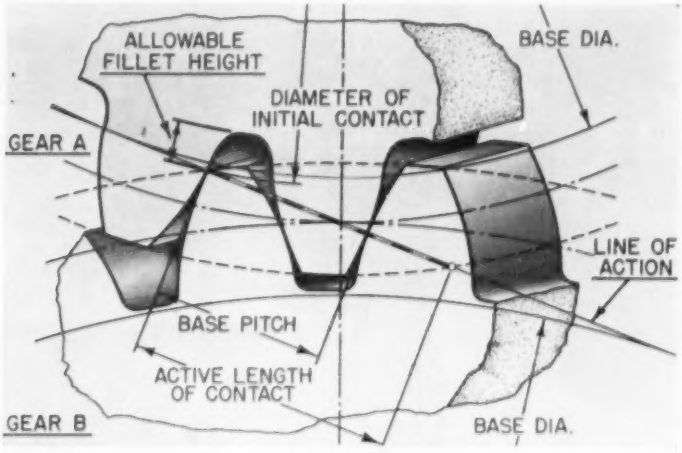

Fig 6—Without tip relief, the tip of the tooth of gear B will contact the flank of the tooth in gear, A, and perhaps cause flank wear and noise. This layout also determines the maximum allowable fillet

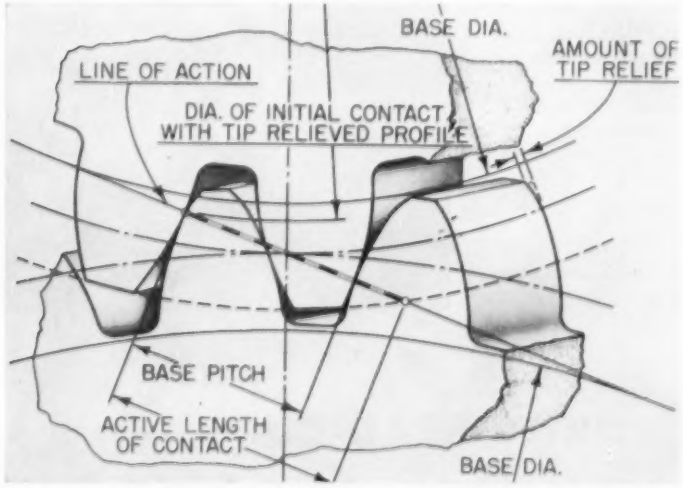

Fig 8—Theoretically, contact of gears with tip relief starts at the point on the profile where it departs from a true involute

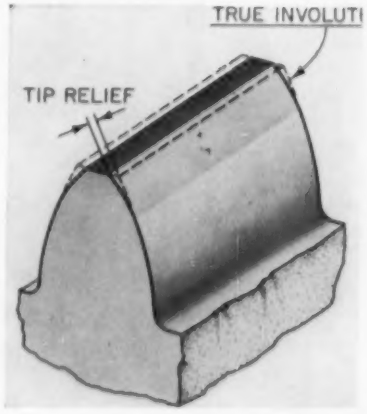

Fig 7—Tip relief provides a cushioned entry

This contact is prevented by tip relief, which provides cushioned entry of each tooth into its mating tooth space, thereby allowing for dimensional deviations that exist as a result of tolerances in gear manufacture. A modification of the profile thins the tooth at the tip. The relieved portion of the profile recedes gradually below the theoretical form from the starting point of the relief to the tip of the tooth. Effective clearance between the actual and theoretical profiles is provided.

Standard finishing hobs and milling cutters for full-depth, 14½° and 20° pressure-angle gears are made to produce tip relief. Tools of these types also provide tip relief when made to order for gears of pressure angles between 14½° and 20° or pitches other than standard, so long as full depth of cut is maintained.

Gear-shaper cutters are usually made without provision for tip relief, unless its need is specified. To produce tip relief to certain specifications, shaper cutters with the "constant relief" type of flank modification are furnished.

For spur gears on which the amount of tip relief is not critical, the "flank type" modification may be

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FOR DRILLING, CHAMFERING, TAPPING, ROUGH BORING—FINISH BORING

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DRILL HEAD CO. Detroit 34, Michigan

engineers and manufacturers of production machines and drilling equipment

GEAR TOOLING—V

employed. This design is characterized by the fact that it cuts an ever increasing tip relief as the cutter is sharpened.

Tip relief is usually limited to avoid reducing the contact ratio below the theoretical minimum of one. Where the contact ratio developed by the fundamental design is little more than one, therefore, tip relief is seldom used. Because of this restriction, gears of combination pitch or other stub-tooth design and gears with pressure angles above 20° are usually made without tip relief.

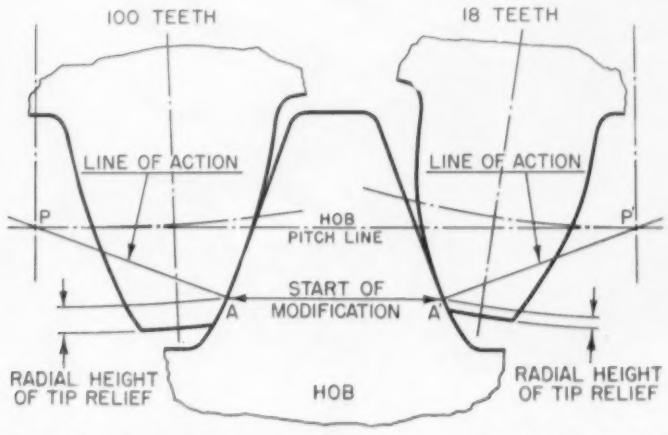


Fig 9—Radial height of tip relief increases with the number of teeth in the gear, when cut with a standard hob. However the line of action AP and A'P' is of the same length in both cases

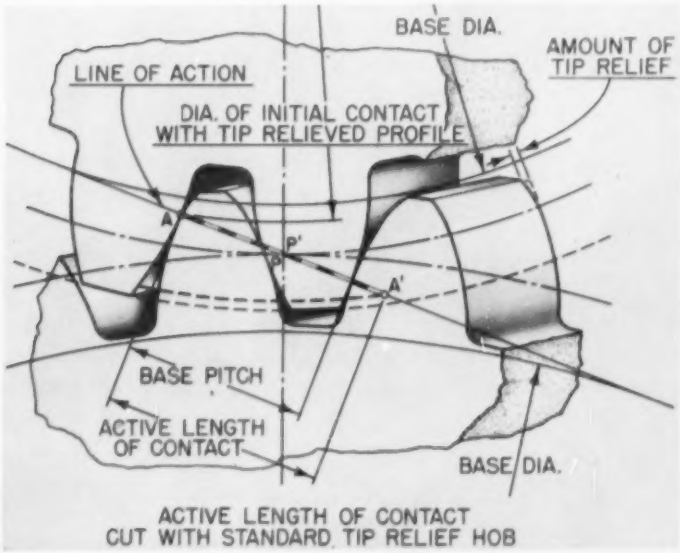


Fig 10—Tip relief limits the line of action when the 100 T and 18 T gears are run together. Contact ratio for 20° pressure angle is about 1.4; for 14½° pressure angle approximately 1.6

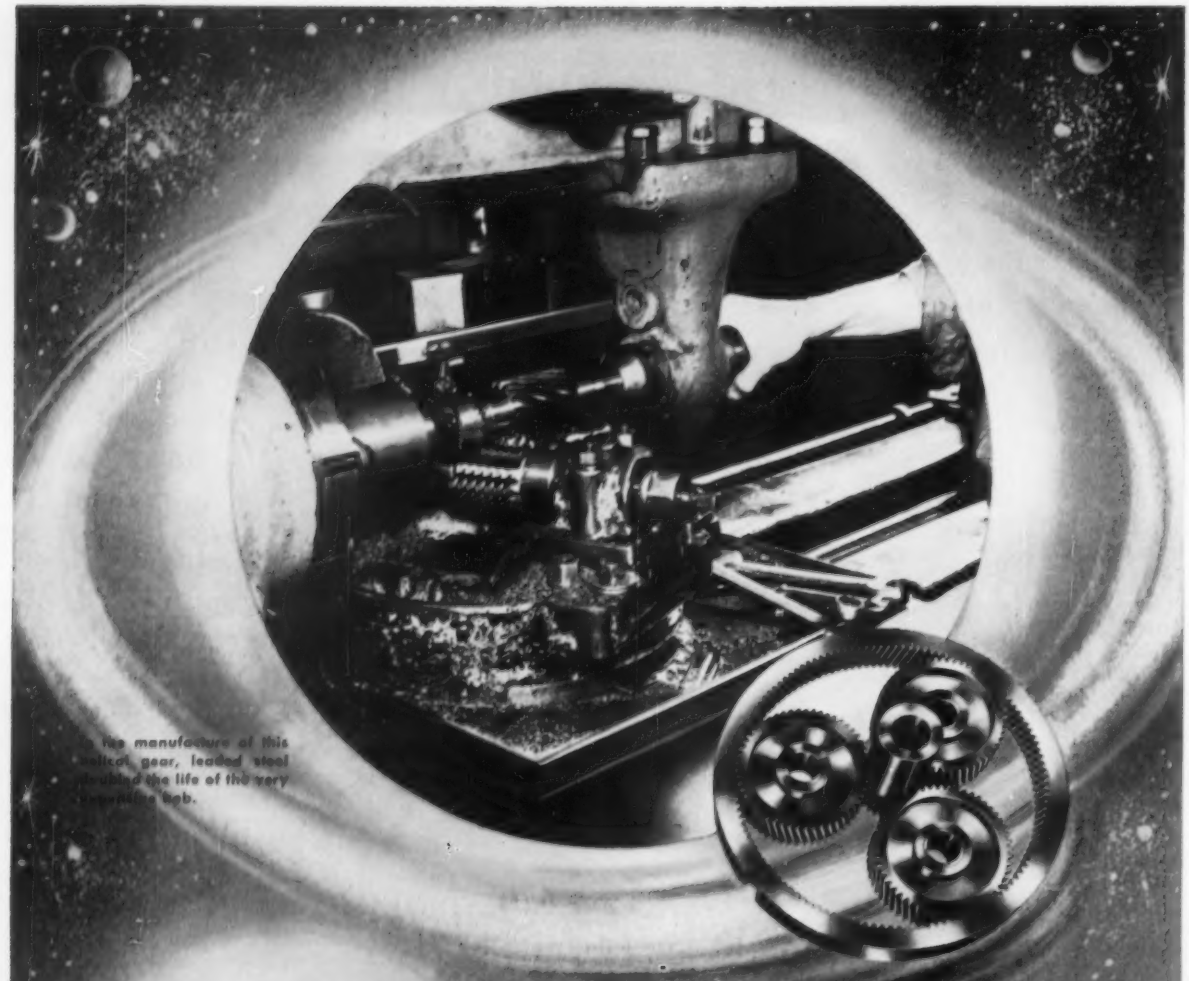
The amount of tip relief obtained from a certain hob or gear shaper cutter will vary with the number of teeth being cut. In standard hobs, the modification is designed not to touch gears of standard proportion with 12 teeth or less, but will, theoretically, produce tip relief on all gears having more than 12 teeth. Actually, it takes somewhat more than 12 teeth to develop an effective amount of tip relief. On larger gears tip relief increases, starting at approximately one-third of the addendum from the outside diameter when the number of teeth is very high.

Although hobbed tip relief varies in radial measurement with the number of teeth, the involute profile remaining between tip relief and pitch line is the same, by line of action measurement, on all gears of standard tooth proportions with not less than 12 teeth.

Similarly, shaper cutters with "constant relief" flank modification may be furnished to cut tip relief on all gears of more than 12 teeth. Because the generating action of a gear-shaper cutter changes with a reduction in size, as from sharpening, a modification in its tooth form does not produce exactly the same profile on all gears, as does a hob. This variation is small, however, so it seldom requires consideration in practice.

The failure of standard flank modification on either hobs or gear shaper cutters to cut effective tip relief on small numbers of teeth is unimportant in the light of practical requirements of most applications. The smaller gear of a pair is usually the driving gear, with tooth contact on the addendum moving from the pitch line to the tip. This action is less conducive to scuffing, scoring, or gear noise than where contact moves from the tip. In most gear sets, therefore, tip relief is not needed on the driving gear.

Unmodified involute is preferred on the driving gear in many applications to assure that driving contact by the driving addendum will not be relinquished to the entering



In the manufacture of this helical gear, leaded steel doubled the life of the very expensive hob.

Another star in this production is

COPPERWELD LEADED STEEL

For many years, The Philadelphia Gear Works has been a leader in the field of making gears of all types, from the very simple to the most complex, precision assemblies.

The faster feeds and speeds with which leaded steels can be worked give them an average decrease in production time of 30%. In some cases production time was decreased by as much as 68%.

In many cases, the life of expensive cutting tools was increased 100%.

Often the finer finish of Copperweld Leaded Steels reduced the final de-burring and polishing operations. Truly, Copperweld Leaded Steel is the steel with "built-in productivity."

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For further details on Copperweld Leaded Alloys, write for free booklet, "Lead Treated Steels."

GEAR TOOLING—VI

tip of the driven gear. Heavily loaded, slow-moving gears are the principal exception. Here, even though the direction of sliding is favorable, tip contact may introduce excessive unit pressures resulting in surface deterioration and structural failure.

Long and short-addendum gears should not be cut with hobs having standard modification for tip relief. The tip relief on the short-addendum gears, when cut with standard hobs, covers almost the entire addendum and reduces the contact ratio to a critical point. In general, care must be exercised in applying tip relief to either gear of a pair where the number of teeth in one of the two gears is in the realm ordinarily subject to undercut.

TIP CHAMFER

Tip chamfer on a gear is a corner break at the outer edge of the teeth. As viewed in a transverse plane, it usually lies at an angle that removes approximately equal amounts of surface from tooth profile and tip flat. The size or position of a tip chamfer is commonly expressed by the radial distance from the outside diameter of the gear to its intersection with the profile. The intersection is referred to as the "start of chamfer."

Table 2 gives specifications for tip chamfers recommended for general application. Values are given for both radial and width-of-flat measurement. The latter is approximate because it will vary slightly with pressure angle.

Where tip chamfers are incorporated, they are usually cut simultaneously with the gear teeth by chamfering ramps in "semi-topping" tools. In practice, these tools are made to cut only a certain gear or a limited range of gears.

Tip chamfers are beneficial in several ways. They protect the tooth profile against damage from bumps on the tops or corners of the teeth. They aid the control of burrs that sometimes occur at the top of the teeth. They are sometimes used in place of tip relief to prevent tip contact, particularly where involute contact cannot be spared to accommodate tip relief.

The amount of chamfer obtained from a semi-topping tool depends upon the number of teeth being cut, the gear OD, the tooth thickness, and the helix angle in the case of a helical gear.

The exact tooth thickness cut and the gear OD are subject to manufacturing variations. Tolerances to which these elements are controlled influence the accuracy to which the semi-topping tool can produce tip chamfers. Table 3 shows variations in tooth thickness and gear OD allowable in maintaining chamfer specifications shown in Table 2.

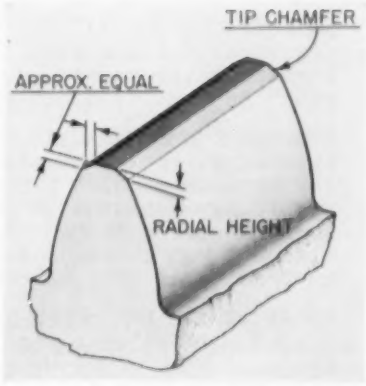


Fig 11—Tip chamfer is usually cut simultaneously with the teeth by semi-topping tools that incorporate chamfering ramps

table 2—STANDARD TIP CHAMFERS*

DIAMETRAL PITCH	4	5	6	7	8-9	10	12	14	16 & up
RADIAL MEASUREMENT	0.014 0.030	0.013 0.027	0.012 0.025	0.010 0.022	0.009 0.020	0.008 0.017	0.007 0.015	0.006 0.013	0.005 0.012
APPROXIMATE WIDTH (NORMAL)	0.028 0.060	0.026 0.054	0.024 0.050	0.020 0.044	0.018 0.040	0.016 0.034	0.014 0.030	0.012 0.026	0.010 0.024

*Illinois Tool Works

table 3—CHAMFER CONTROL TOLERANCES

All values are total variation

DIAMETRAL PITCH	4	5-6	7	8	9-10	12	14 & up
TOOTH THICKNESS	0.002	0.0015	0.0015	0.001	0.001	0.001	0.001
OUTSIDE DIAMETER	0.010	0.008	0.006	0.006	0.005	0.004	0.003

Note: These tolerances are somewhat closer than commonly required for gears without tip chamfers

A series on "Gear Tooling" was begun in an earlier issue (AM—Aug. 13 '56, p 159) because cutting tools for production of generated shapes have undergone considerable development in recent years. Further information on the selection of such tools will be published in an an early number

What's New

IN STEEL FROM STOCK

In the news today are many developments of interest to those who specify, buy or work with steel. Ways in which you can raise efficiency and lower costs in your operations may be suggested by the following summary.

NEW IN RYERSON STOCK—Cold finished Ledloy hexagons in sizes up to 3". (Previous maximum size: 1½".)...Welded, square, structural tubing with a lighter wall. Advantages: Costs less yet has all the strength, good surface, etc., needed for ornamental applications.

NEW TYPE 202 STAINLESS NOW AVAILABLE FROM RYERSON—Pioneering with a new type of stainless steel, Ryerson now offers Type 202 sheets, No. 2B and No. 4 finishes in popular gauges and sizes, for quick shipment from stock. Since nickel may continue in short supply for some time, interest in this new stainless has been strong. Reasons: Type 202 contains only half as much nickel as Type 302 yet compares favorably with 302 in corrosion resistance, fabricates as readily as 302 and costs 2¢ per lb. less.

WHAT ABOUT HOT ROLLED BARS? A leading metal-working publication recently listed hot rolled carbon steel bars as a hard-to-get product—but this is not the case when you draw on Ryerson stocks. Our inventories of hot rolled bars have seldom been better, both as to tonnage and size range.

NEW, ACCURATE I.D. ON CYLINDER TUBING FROM STOCK—In hydraulic cylinder applications, the I.D. is the critical tubing dimension. Yet, until now, buyers of tubing from warehouse stocks could specify only O.D. and wall—and wall thickness may vary as much as plus or minus 10% under standard manufacturing tolerances. As a result, I.D. dimensions could vary so widely that tubing was not suitable for cylinder use. But now buyers may specify both O.D. and I.D. when ordering cold drawn seamless tubing from Ryerson (in 2" through 9" O.D. sizes)—thus assuring the accurate I.D. dimensions needed for cylinders. We believe we are the only warehouse to carry this stock.

REPORT ON NEW E-Z-CUT PERFORMANCE—New proof of the quality of Ryerson's leaded plate steel, New E-Z-Cut, was reported by company which recently made a mold for a miniature tire. Some of the tiny lands forming the tread design were only .015" thick but $30 worth of New E-Z-Cut took the risk out of the $4000 machining job. Because New E-Z-Cut is remarkably clean and free of excessive stringers, even the finest lands of the mold were sharp and true. Because New E-Z-Cut machines up to 30% faster than mild steel, the difficult job was completed in record time. High finish made the mold easy to prepare for plating.

FLUID LINE TUBING WITH IMPROVED FINISH—Another new Ryerson product is Hydra-Luster hydraulic fluid line tubing which has an unusually beautiful finish, free from scale and surface defects because of a new method of atmospherically controlled annealing. This tubing is on hand in all sizes through ¾" O.D. x 16 gauge wall.

PVC PLASTIC PIPE IN LARGE DIAMETERS—8" and 10" pipe in both schedule 40 and 80 have been added to growing Ryerson stocks of the remarkably anti-corrosive plastic—Ryertex-Omicron polyvinyl chloride. Also available: smaller size of pipe, fittings, sheets and rods. For complete data on properties, resistance to more than 300 chemicals, etc., write for technical booklet 80-3.

RYERSON CERTIFIED QUALITY

JOSEPH T. RYERSON & SON, INC. PLANTS: NEW YORK • BOSTON • WALLINGFORD, CONN. PHILADELPHIA • CLEVELAND • CHARLOTTE • CINCINNATI • DETROIT • PITTSBURGH • BUFFALO CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Talking Shop . . .

Clean for Bond

ANY SMALL BOY can tell you that clean water and dirty hands just don't like each other. A scientific fact that may be behind this antipathy is being put to good use in metal bonding. Aircraft Industries Association reports that the fact that a drop of water spreads on a clean surface but stands up on a dirty surface is used to check panels before bonding. A single drop of distilled water is dropped on the metal and the angle of elevation of the drop is measured with an optical instrument. The higher it stands, the dirtier the surface.

Pallet Progress

PALLETIZED LOADING has been carried a long way at Buick, where 95% of incoming shipments now arrive in palletized form. When ten steerng wheels used to come in a carton with a stapled cover, 156 now arrive in four open-faced boxes with a single lid which lifts off easily. Radios used to be two in a carton, now there are 80. The new pack prevents tossing around, is easily handled by fork truck. Started a bit over two years ago, the program has had enthusiastic cooperation from suppliers. One supplier was so impressed by the savings when he switched from individual cartons to multiple packs that now he palletizes the entire output.

Hot Brass

DIES ARE the biggest headache in hot extrusion. Mueller Brass Co. has recently switched from steel to chrome carbide to cope with unpredictable product size and varying hardness. Using Grade 608 chrome carbide, Mueller is able to hold a ±0.006-in tolerance on 0.441-in.-dia rod extruded from 8-in billets. For this size, the carbide die averages 20 times that of steel dies, but the average advantage on all extrusion sizes runs 5 to 1. One disadvantage: the steel dies can be salvaged by reworking for larger sizes while carbide can't.

You Never Know

WHEN YOU DEVELOP some new principle, you can never be sure where it will lead. Ultrasonics, for example, has been applied to cleaning, machining, emulsifying, soldering, and mixing. And now comes word from Aeroprojects, Inc, that it is possible to form high-strength welds by ultrasonic energy alone, without the application of any form of external heat.

You just place the work between two sonotrodes (a nice new word), apply light pressure, and turn on the power. You don't have to be fussy about cleaning the surfaces, and you can join similar or dissimilar metals with equal ease, including aluminum to copper, or gold to steel. The only catch, so far, is that it is limited to material from 0.001 to 0.025 in. thick, joined to other material not over 1 in. thick.

Fighting the Squeeze

FAST ACTION is coming from Allis-Chalmers on the suggestion that the engineering shortage can be eased by supplying engineers with technical assistants. A 3-month training program has been started for high-school graduates selected on the basis of technical aptitude. Included in the course are company organization, products, plant and office arrangement, company procedure, engineering math, blueprint reading, curve plotting, shop sketching, drafting and engineering standards, and similar subjects. Graduates of the course will be assigned to departments with technical personnel to free fully trained engineers from routine and time-consuming duties.

Automatic Mail

THE GERMAN POST OFFICE plans to introduce automatic mail distribution. About 70% of the letters originate with commercial establishments, and a four-number code has been assigned that is based on the telephone numbers. A pilot electronic sorting system is already in use.

The Eyes Have It

WHEN HILLER Helicopters, Inc, Palo Alto, Calif, began to make "free-blown" Plexiglas doors and windshields, unequal stretching affected optics, so the pilot saw a double image in certain areas. It was necessary to provide additional vacuum outlets in certain areas of the mold (a female only) to insure uniform expansion of the bubble. In this method of vacuum forming, the heated Plexiglas never touches the mold, vacuum being cut off when the part being formed crosses a light beam (see also *AM*—Nov 21, '55 p 151 for another method).

Dampeners

KIRKSITE IS CUT with a circular woodsaw at Boeing Aircraft, Seattle, but with a tricky change in the blade. Each carbide tooth is backed with a brazed-on soft-steel pieces which soaks up incipient vibration. The same principle is used on a 2-bit boring tool for Kirksite or other materials that tend to create vibration. The bar is bored at its axis, and the bored hole filled with a soft-steel bar. This damps the vibration as it starts. One of the engineers used the same principle on his carbide-toothed table saw at home, and added a fillip. He applies CO_2 from the Fyr-Fyter extinguisher off his boat as a coolant, and cuts ceramic tile, brick, aluminum tile and pipe on it without trouble.

US Shipbuilding—Gloom To Boom

WASHINGTON—After wallowing in the doldrums back as far as World War II, U S shipyards are today riding the crest of a wave of prosperity—and it's all happened since last summer, when shipbuilding hit a postwar low. Two shots in the arm have brought the industry back to life in record time: Government shipbuilding programs, and replacement of obsolete vessels in America's merchant fleets. The current high rate of activity is expected to hold for the next 10 years, possibly even longer than that.

Feast or Famine

Some indication of the feast or famine situation that has been the lot of U S shipyards may be gotten from the employment records of the yards currently working on refurbishment of the merchant fleet. Back in 1953, these yards employed some 23,000 people. By last summer, their payrolls had dropped to a postwar low of 4000. Today they're up to 12,000 and climbing fast.

To combat the industry's feast or famine aspects, steamship companies have agreed to put long-range replacement programs into effect. This would keep up a steady flow of jobs. And Congress last year voted $84 million as the government's share in merchant shipbuilding, increasing the appropriation to about $98 million this year.

Construction Triples in Year

By July 1 of this year, 57 ocean-going merchant ships were either under construction or in the process of major conversion, as opposed to only 19 a year ago. Of 1956's 57 ships, 42 are being built for private shipping firms at a total cost of $362 million. The government's share of the $362 million kitty amounts to $56.7 million in subsidies and other aid.

The other 15 ships will be paid for by the government. They're primarily slated to furnish logistic support to the Armed Forces as part of the Navy's Military Sea Transportation Services.

Now on the docket for 1957 are another 56 merchant ships, to be built under the aegis of the Maritime Administration at a cost of around $500 million. Contracts for these ships should be let by next June. Of the $500 million, industry will put up $358 million, the government the rest. Out of the government's share will come four government ships and experimental conversion work on a Liberty ship, plus $17 million for building the hull of the nation's first nuclear-powered merchant ship (authorized this year by Congress). Atomic Energy Commission will build the power plant.

That's the merchant shipbuilding side of the picture. Here is the Navy side:

In the last few years, Navy shipbuilding and conversion has stacked up dollarwise this way: 1954 $430.8 million; 1955 $633.5 million; 1956 $1 billion. And for 1957, nearly $1.5 billion is appropriated. Much of this work goes to private shipyards because (1) Navy yards don't always have the space or facilities to do the work, and (2) the government wants to keep the shipyards going to retain a hard core of skilled shipbuilders for national defense.

$1.6 Billion Current Navy Work

Thus in July of this year the Navy had $1.6 billion worth of work in progress with private shipyards, including new construction on 62 ships and 43 service craft. In all, 21,411 civilians are at work on Navy ships.

The U S Navy's 10 shipyards are currently turning out 15 new ships with 6376 workers at a cost of $802.7 million. Some 10,500 workers are also employed in converting 20 Naval ships at a total cost of $203.6 million.

That's the current picture, add to that the Naval work slated for 1957—25 new ships (two to be paid for out of the '56 budget, and 19 major conversions, to say nothing of several hundred small service and landing craft—and there's bound to be plenty of activity around both Naval and private shipyards for quite a spell. But while the industry's prospects are better than they have been in a coon's age, every shipbuilder knows from bitter experience that you can't count on new ship construction until the work is in the yard. Further complicating the picture is the steel shortage. How long it will last and what its long-range effects will be are anybody's guess.

However you look at it, the big prop to all U S shipbuilding is government help, whether it be in the form of dollar aid or pro-domestic restrictions. Without the latter, U S yards would lose business right and left to foreign competitors, who can turn out the work for 40% or so less. That's why we have the "construction differential subsidy," a form of Buy-American Law for shipbuilders. Under the subsidy, the government pays the difference in cost to build a ship domestically as against building it at a foreign yard. That's only for ships declared essential to U S foreign commerce, though, but it includes practically any ship on a regularly scheduled run. In theory, tramp steamers and tankers qualify, but it's been several years since any dry cargo tramps were built, and no tanker has every gotten a construction subsidy.

Pro-Domestic Restrictions

Another pro-domestic government restriction applies to ships operating in the coastal trade—they must be built in U S yards, and without benefit of government construction differentials. On top of that, all shipping companies that receive operating differential subsidies must replace ships when they're 20 years old. This forces private U S shippers to start building now, because many of their ships are nearing the 20-year limit. It's figured that nearly 80% of the present U S merchant fleet will have reached the age of obsolescense in the mid-60's.

Phased Building Programs

That's why the government is pressuring shipping companies to start phased shipbuilding programs, so the yards will have a steady flow of work and not be swamped with simultaneous orders because most of the fast-obsoleting ships were built within a short period of time during World War II.

A dozen or so shipping companies are obliged to replace about 170 ships under this agreement, and some of them have already signed long-range building contracts. Cost of building the ships is estimated at around $1.5 billion, with some $600 of it coming out of the government's pocket for subsidies.

Aside from construction subsidies,

in One Short Year

the most active spur to shipbuilding is the "Trade-Out" Program, in which U S shipping firms can sell or transfer ships from the American flag to a foreign flag, such as Liberia or Panama. Tightly controlled by the Maritime Administration, trade-out is a form of writeoff in which the U S shipper can sell an old ship to foreign countries only if he agrees to build a new one in a U S yard. Right now, this program is worth $140 million in work for domestic shipyards.

Then there's the "Trade-In" Program, under which the government will buy an old ship if the shipping company agrees to build a new one of similar tonnage. Trouble is, the government won't pay the money that foreigners will for a ship and nothing at all has happened along this line in recent months, although there's some $50 million worth of unfullfilled trade-in orders still on shipyards' books from 1955.

One more prop to a continued high level of shipbuilding over the next decade: Federal insurance of private loans for shipbuilding has been upped to 100% of construction loans, and 87½% of total vessel cost. Before it was 90% of 87½%. This means that the shipping companies put up only 12½% of their own money, with the government standing 100% behind loans.

. . . and now the Navy's New "Nuclear Look"

May Shoot the Moon for Shipbuilding

WASHINGTON—The Navy wants as many nuclear-powered ships as it can get—not just submarines, but all types, guided missile carriers, aircraft carriers, the works—and it wants them fast. With the age of nuclear power on the high seas just dawning, the Navy can't wait 10 to 15 years for technological advances before it starts to build ships.

For one thing, the Russians aren't just standing idly by twiddling their thumbs. It's going to be a race to see who gets the "Nuclear Look" fustest with the mostest. That's why the number of new ships to be built may go as high as 200-300 before we get through, providing Congress puts up the money.

That means U S shipyards, Navy and private, will build 200-300 new ships, not just conversions to atom-power plants. One big reason is that the cost of converting present ships to atomic power is almost as great as that for building a new ship. Not only that, a big slug of the Navy's present ships are approaching the point of becoming obsolete, and it's just not good business to pour money into an outdated piece of equipment.

Even if the Navy builds only a few atomic ships a year, which is likely all that Congress will approve, the shift to nuclear power will take years to accomplish. But the Navy wants to start whittling away at the job now.

For example, the Navy wants to build at least one big Forrestal class carrier a year until it has 15 of them by 1965. Right now, two are in operation and four building. By 1961 or 1962 you'll see the first nuclear powered aircraft carrier launched.

And while nuclear power is several years away from being economically feasible for merchant ships, Congress has already approved construction of the first one. It'll cost $40 million. So far the contract hasn't been placed with a yard.

Too, the Navy is well on the way to having the world's first atom-powered surface ship—a guided missile light cruiser. Contract for reactor component compartments has already been let for $18 million to Westinghouse. The cruiser itself will be built by Bethlehem Steel at Quincy, Mass. Slated for 1960 completion, the cruiser will attain 30 knots, will cost in the neighborhood of $87.5 million. This brings to 17 the number of nuclear ships and submarines the Navy has operating or building.

13 Atom Subs Building

But the Navy's real experience so far has been with atom subs. Right now it has one, the Nautilus, in operation, with the Seawolf slated for launching sometime this year. Thirteen others have been authorized by Congress and are on the drawing boards or being built, with nine expected to be ready in 18 to 36 months, and contracts for the other four to be let soon.

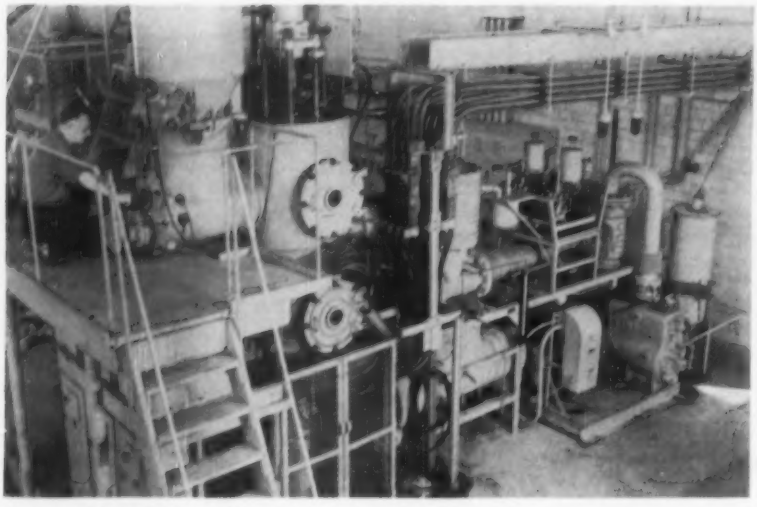
Four of the 13 on the way are attack class submarines, smaller than the Seawolf and Nautilus, one is being built by General Dynamic's Electric Boat Division at Groton, Conn; two are at the Portsmouth, N H, Naval Shipyard; and one at Mare Island, Calif, Shipyard.

A similar submarine capable of launching guided missiles is also building at Mare Island.

Seven other nuclear-powered attack subs will be based on the advanced hull design of the experimental S S Albacore, which looks something like a whale and is said to be "by far the most maneuverable and fastest submarine that has ever been operated beneath the seas." Two of the seven are already under construction, one by Mare Island and the other by Electric Boat. The other five have not yet been placed in shipyards.

Last and biggest of the nuclear-powered sub fleet is a radar-picket sub, the Triton, which will be powered with two reactors and will be able to make 34 knots—enough to operate with the Navy's fast carrier task forces.

While the Navy won't release cost figures on the two subs it has already built—experimentation and design throw them out of proportion they say—costs are already dropping. Already cost of some items has dropped as much as three-fourths, and within the next five years, the Navy expects to cut the price of nuclear construction in half. One reason: much of the initial construction has called for complete new design of equipment and extensive experimentation with new materials, now much of this can be mass produced.



Arc-casting is automatic . . .
PSM machine starts with powdered molybdenum; presses it into electrode shape, sinters the material, and melts it in electric arc under vacuum. Metal forms in water-cooled copper mold. Resulting molybdenum has better strength, solidity, and uniformity than powder-metal molybdenum. Less gas content helps ductility

1000-lb ingot has 9-in. dia . . .
Arc-cast ingot can be machined, welded, forged, or rolled into sheet or bar shapes on tool-steel mills. Theoretically there is no size limit

Navy Woos Heat-Resistant Moly

DETROIT — Is molybdenum THE high-temperature material of the near future? A lot of top U S metallurgists and engineers think so, and so evidently does the Navy. This was brought out at a two-day symposium on molybdenum, sponsored by the Office of Naval Research here, and attended by some 300 scientists and engineers, who heard the results of Navy-backed molybdenum research and development programs. Among the findings reported:

Molybdenum becomes oxygen-embrittled rapidly at high temperatures; which is one problem only partly solved so far. But for fabrication, a proposed design by Universal Cyclops Steel Corp may do the trick. This was reported in a paper by J D Nisbet and W L Bruskart. The idea is called "closed-circuit fabrication," and includes working the metal at high temperature in a sealed room, with plenty of space for forging, impacting, and rolling equipment, surrounded by an inert gas. Argon has been considered, but helium may become the standard.

Operators would have to work in pressure suits, supplied from outside the room with air and communications. They would enter and leave through close-fitting latex-lined doors (an earlier proposal was a wringer-like rubber belt, with soft rubber rollers, that would convey operators in and out. The idea was abandoned on the grounds of "physiological problems"). The sealed-off room would allow fabricating the metal at 3400 F with no danger from oxygen.

Forging Turbine Blades

Turbine-blade forging was reported in a paper by J J Russ and G E Schrader, Steel Improvement & Forge Co. Working with 0.5-Ti-Mo alloy, it was found that the resistance upset and forge method worked best, and that 70-80% of the deforming had to be done below the recrystallization temperature. On successive forging operations, temperature of the heat was lowered. Anvil temperature was important in upsetting, and had to be cooled to 1000 F.

In a paper on the protection of molybdenum against high-temperature oxidation, J J Harwood, Office of Naval Research, noted that a successful coating for the metal must be non-porous, shock and impact resistant, be able to stand up against thermal shock and erosion as well as fatigue, and should be ductile. No presently available coatings are entirely satisfactory; the best being ceramic chromium frit, zirconium bonded with zirconate of calcium, magnesium, or barium, and zirconium oxide. These hold up for short periods at high temperatures, but are not shock resistant.

Arc-melting was covered in a paper by R G Timmons and G A Yingling. Normally a high-grade molybdenum powder is arc-melted in a vacuum with carbon as the deoxidizer, resulting in metal within the handbook range of purity for the pure metal.

Molybdenum can also be produced with a non-consumed tungsten electrode. Molybdenum is inserted in the furnace as small pellets of powder, and melts into detachable copper molds, surrounded by removable water coils. This is a design to be marketed. It allows regulating melting time, to obtain purity as desired.

R R Freeman, Climax Molybdenum Co, discussed properties and applications of molybdenum, showing that commercial molybdenum is now available in machined ingots up to an 8¾-in. dia, weighing 800 lb; in extruded bars to a 5¾-in. dia; rolled bars with a dia of ½ to 3½ in.; plate from ¼ to 1¼ in. thick and sheet from 0.0005 in. Drawn wire, swaged bars, and ground bars are also available. Machining, forging, welding, brazing, and drawing are practical.

"Buy American" Turbine Dilemma

WASHINGTON—The administration has taken itself off the hook temporarily, but only temporarily, on the touchy question of who gets the contract for Corps of Engineers power dam turbines—the lowest U S bidder, or if its bid is 6% or more lower in accordance with the law, the lowest foreign bidder?

For four months U S turbine makers have been waiting for the answer to that one. The case in question, who gets the contract to make turbines for the Corps of Engineers' Fort Gaines, Ga, hydropower plant. The government's solution: advertise for new bids.

British Bid Qualifies

Under current administration policy on the "Buy American" Law, the $2-million order should go to a British firm, English Electric Co, whose bid was 17% under that of the lowest American bidder. By law, a U S turbine maker can lose out if his bid exceeds that of a foreign firm by 6% or more.

Last May, five bids were received on the Fort Gaines turbines: English Electric $2,393,639; Newport News Shipbuilding & Drydock $2,890,897; Allis-Chalmers Mfg Co $3,040,020; Baldwin-Lima-Hamilton $3,155,930; and S Morgan Smith $3,257,224.

Political Hot Potato

This put the administration on the spot—had it given the order to English Electric it could have meant political suicide in key cities where unemployment is crucial—like Detroit and South Bend. On the other side of the coin, if the administration took the 17% higher bid of Newport News Shipbuilding & Drydock, it could be accused of betraying its own pro-foreign trade policies.

Either way, the situation was a political hot potato, and the only way to cool it off is to ask for new bids on grounds that the bids have "ambiguities" in phrasing of specifications. Now, the Corps of Engineers' Mobile, Ala, District will re-advertise for bids on the project and will set new deadlines.

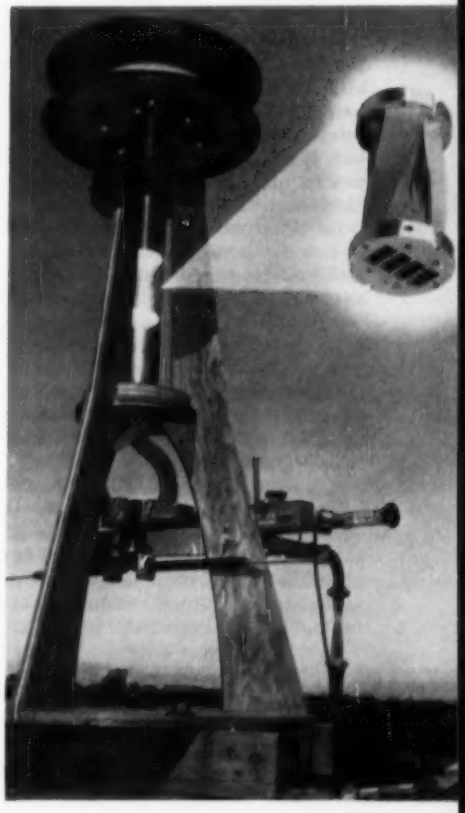
The Fort Gaines case underscores the touchy "Buy American" policy. In 1954, the Eisenhower administration eased the Law's provisions to lower the preferential margin for U S suppliers from 25% to 6-10% to give foreign firms a better break on U S government contracts. But, and it's a big but, agency chiefs can rule in favor of the domestic bidder, no matter what the bid differential, if it will help stave off regional unemployment, aid small business or the national defense.

For some time, U S turbine manufacturers have been urging the government to take a definite stand on limiting its procurement of hydraulic turbines to domestic suppliers. Reason: at least 72% of all such turbines used in the U S are bought by the government.

Speaking for U S turbinemakers at a recent Office of Defense Mobilization hearing, the National Association of Electrical Manufacturers said such decisions as the Fort Gaines one can't be made on a case by case basis because "the industry is too vulnerable to federal procurement policies to survive piecemeal determination of its future." The Fort Gaines contract, says NEMA, represents 10% of the average annual bookings U S makers get from the government.

Not only that, the NEMA people claim, foreign suppliers can underbid American ones at will and the U S industry has already lost its export market to overseas suppliers. Unless the government recognizes the importance of the turbine industry to national security, NEMA spokesmen say, it will hand the bulk of future turbine sales over to European makers and "proceed to destroy the industry."

New Twist in Electronic Plumbing

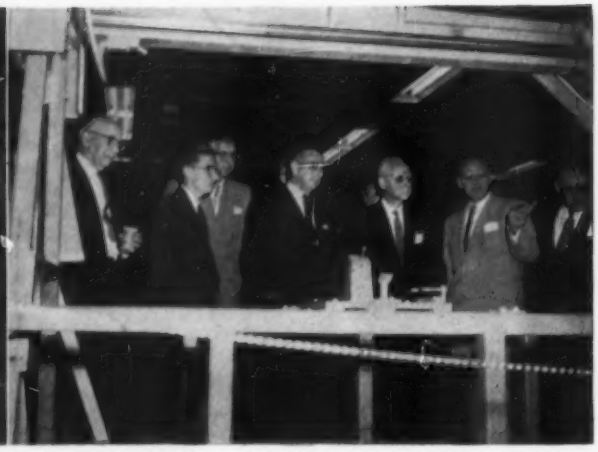


MENLO PARK, CALIF—For a new radar-detection device that must receive in all directions at once, Stanford Research Institute was faced with the knotty problem of making wave guides of constant ID cross section, but with a helix (photo). To do it, a new fabricating technique was evolved: brass sheet 0.005-in. thick (could be thicker in practice) was stamped to the wave guide cross-section, with small-diameter holes in each side wall. Then these laminations were stacked on wires, the wires were pulled down tight, and the stack twisted to the desired helix. It is held in position by soldering or brazing.

Avoids Tough Machining

The resulting "plumbing," about 4 inches long, has the same electrical characteristics as a solid section. And it avoids a tough machining job.

The technique was evolved at Stanford Research Institute's Model Shop and Microwave Group in response to a request from the U S Signal Corps, which had run afoul of mechanical complications in the course of studying new types of microwave antennas.



HARVESTER PLANT EXECUTIVES look over two of the exhibits in the company's "personal" machine tool show at IH's Manufacturing Research Center in Chicago. Left: a breaker arm assembly unit developed at Harvester's West Pullman Works. Right: an automatic machine loading mechanism built and exhibited by Seneca Falls Machine Co. All machine tools were demonstrated under power

Harvester's Personal Machine Tool Show

CHICAGO—What's *really* new in metalworking machines and techniques? That's something every operating man in the industry would like to have at his fingertips, but it's also something that's not easy to do, particularly when you're sitting out in a branch plant of a big outfit—a long way from the home office. But International Harvester has figured out the answer—you can do it if you're big enough—hold a private machine tool show of your own, and team it up with an intensive series of two-day conferences on the latest metalworking techniques—accent on automation.

The idea came out of Harvester's Manufacturing and Research Council: invite 400 top executives and technicians from 21 outlying plants in the U S and Canada for seven two-day sessions at the Manufacturing Research Department at Chicago headquarters. Then invite top outside authorities on automation to speak. And, most important, invite your machine tool suppliers to exhibit their newest developments in automated machines, automatic gaging devices, and feedback controls.

In that way you bring your outlying plants, as well as headquarters, up to date on (1) how some of your individual plants have made use of new machine tools and automation devices, (2) how they have developed special automated units to solve particular manufacturing problems, (3) what your headquarters research and development staff has turned up in the way of new techniques and equipment.

At Harvester, where the last of the seven conferences will wind up October 12, sessions are divided into discussion of new techniques and developments, and into demonstrations of new machine tools by builders' representatives.

Tool Builders Participate

One of the demonstrated machines is an automatic assembly unit developed and built at Harvester's West Pullman Works for assembly of breaker arm springs for tractor engine distributors. This one machine does the work of five, costs $15,000 to build and saves $9000 a year while turning out a better-quality product consistently. It can easily be revised should product design be changed.

Also demonstrated under power for Harvester were precision grinding and honing machines built by Sheffield Corp, Heald Machine Co, Landis Tool Co, and Micromatic Hone.

Rough and finish turning of shafts with carbide roughing tools and ceramic finishing tools in the same setup was demonstrated by Sundstrand Machine Tool Co, using a Model 14 automatic lathe equipped with punch-card controls and an automatically indexed tool block. High speed milling with increased feeds was also demonstrated by Sundstrand, on a 50-hp miller equipped with an as-yet-unannounced Wesson face-milling cutter that uses square throwaway carbide or ceramic bits.

Both Gisholt Machine Co and Monarch Machine Tool Co demonstrated automatic tracer-controlled lathes of recent design. The Monarch machine was equipped with an improved automatic loading and unloading mechanism.

One lathe builder demonstrated (under a bond of secrecy), a brand-new automatic lathe with built-in automatic tape controls that permit programming of form turning and threading with either the tool-post or the turret. This to-date-unannounced lathe was taken out of the builder's research lab especially for this demonstration. It probably won't be ready for the market for some time.

Fellows Gear Shaper Co showed an improved automatically loaded and unloaded shaper for cutting helical transmission pinions. This machine is equipped with an automatic gage with feedback controls that shut down the machine when pinions are out-of-size. Alongside it was a Fellows automatic pinion checker that measures gear dimensions, sorts the pinions to preset limits, records

repeated errors, and feeds back information to gear-finishing machines.

Seneca Falls Machine Co demonstrated a new automatic loading mechanism for handling parts into and out of lathes.

Other automatic gaging equipment was shown by Illinois Tool Works, Federal Products Corp, Pratt & Whitney Co, and Heald Machine Co. Sheffield also demonstrated a new automatic circular thread-rolling machine with capacity for rolling threads up to 2 in. long on parts from ⅛ to ¾ in. OD. Star Cutter Co showed a Starbore drilling machine that uses a two-lip gun drill and high-pressure cutting oil for rapid deep-hole drilling.

In addition, Harvester's Manufacturing Research Dept had on display exhibits of tooling developments made in their plant, and in several of the Co's manufacturing plants. Of special interest was a display of plastic tooling, including gages, assembly fixtures, die sinking models, spot welding fixtures, draw dies for sheetmetal parts, and foundry patterns and core boxes that indicate widespread possibilities of tooling economies.

Also shown were some novel nodular CI forging dies that have proven successful in preliminary tests. Impressions are cast to shape in these dies within 0.010-in. accuracy and do not require machining prior to use. High-speed turning with ceramic toolbits also was demonstrated, as was the fabrication of sintered parts made from powdered metals.

Shielding of arc welds with CO_2 gas, austempering of steel, and induction heating and flame hardening were also shown.

East...

Eastern briefs . . .

Wyman-Gordon reports that in a full year of operation its huge 50,000 and 35,000-ton Air Force presses have "more than fulfilled expectations." They've been operating around the clock six days a week since spring . . . Navy is trying to get money out of Congress for a new ordnance and electronics shop for its **Philadelphia Shipyard** . . . **Capitol Products,** Mechanicsburg, Pa, maker of aluminum doors, is taking over **Read Standard Corp,** York, Pa, maker of stokers and blowers . . . **Sawhill Tubular Products Inc** plans to install a new 12-stand continuous weld pipe mill and make other improvements for a total outlay of $3.5 million at its Sharon, Pa, plant . . . **Armco Steel Corp,** Baltimore, plans to spend $300,000 on an addition to its stainless steel research facilities . . . **All-State Welding Alloys** has just completed the fifth expansion since 1947 to its White Plains, N Y, plant and facilities. This one increased output capacity by a third . . . **General Electric** has consolidated its Schenectady, N Y, Aeronautics and Ordnance Operation with its Aircraft Products Dept at Johnson City, N Y . . . **Aluminum Body Co of Delaware Valley** has been formed at 345 N 57th St, Philadelphia, to make aluminum truck bodies . . . **Mine Safety Appliances Co** will build a battery plant somewhere near Jacktown, Md, early next year . . . **Morey Machinery Co,** New York machine tool maker, has bought out **Globe Forge Inc,** Syracuse, N Y, subsidiary of **Barium Steel Corp,** will use it to make parts for Morey machines . . . **U S Industries Inc,** New York, has acquired **Western Design & Mfg Corp,** Goleta, Calif, maker of missile components . . . **Durant Tool Supply Co,** Providence, R I has opened a new office and warehouse there at 1 Thurbers Ave . . . **Norton Co,** Worcester, Mass, is building a $2-million, two-story Central Service Building. It'll house the plant's engineering department and the service facilities for the whole plant, plus a cafeteria and commissary.

Midwest...

Midwestern newsnotes . . .

If you make chemical processing equipment, you might look up **Wyandotte Chemical Co,** Wyandotte, Mich, which will need $10 million worth to produce chlorine and caustic soda at a $20-million plant to be built at Geismar, La . . . Seen at the various auto press showings this year were a lot of appliance people, who came to find out how the auto companies succeed in obsoleting a good product so thoroughly in just a couple of years . . . Clifford Simmons and Bill Brittain, who took over **Hoover Ball & Bearing Co,** Ann Arbor, Mich, just a couple of years back, have just acquired **Gerity-Michigan Corp,** Adrian, Mich, suppliers of plated parts for autos . . . **Bendix-Westinghouse Automotive Air Brake Co** will purchase **Servel Inc's** assets and facilities at Evansville, Ind, to make refrigeration compressors. All plant, equipment, trade marks, patents and technical info, plus 12.5 acres of land, go with the deal . . . **Ford's** big-time promotion of safety items for cars in '56 fizzled out, with Ford taking an $800,000 shellacking because it tried to put seat belts and crash padding out at cost. Now the price will go up . . . **U S Industrial Chemicals Co,** Division of National Distillers, will set up a 10-million-lb-per-year titanium sponge plant at Ashtabula, Ohio, by 1957's end . . . **Lamson & Sessions Co,** Cleveland metal fastener maker, has sold its East Side (Cleveland) plant for $450,000 to a construction firm . . . New name of **Amgears Inc,** Chicago maker of gears and gear equipment, is **Hupp Aviation Co** . . . **Wagner Mfg Co Inc,** Jackson, Mo, maker of welding accessories, has changed its name to **Lenco Inc** . . . **Fansteel Metallurgical Corp** will build a $6.5-million tantalum-columbium plant at Muskogee, Okla . . . **Caterpillar Tractor Co** has acquired **Englehart Mfg Co,** Davenport, Ia, supplier of parts for Caterpillar . . . Merger of one of the nation's top farm implement makers, **J I Case Co,** Racine, Wis, with a major producer of earthmoving and construction equipment, **American Tractor Corp,** Churubusco, Ind, has been approved by both boards—now it's up to the stockholders . . . **GM's Allison Division** has a new Air Force contract for upwards of $13 million to make J71-A2 turbojet engines . . . **Industrial Molded Products Co** has just moved from Chicago to a new plant in suburban Palatine, Ill . . . **Hills-McCanna Co** has moved into a new $1.25-million, 100,000-sq-ft meter, valve and pump plant at Carpentersville, Ill . . . **International Harvester** is upping prices of its farm equipment 5% . . . **Illinois Tech's Armour Research Foundation** is spending $575,000 on addition to its Metals Research Bldg, on the Chicago campus . . . Chicago's **Acme Steel Co** is building a $15-million plant in Chicago's Calumet Harbor area that will turn out 17,000 tons of semi-finished billets a month . . . **Van Norman Industries** of Springfield, Mass, plans to acquire **Bingham-Herbrand Corp,** Toledo and Fremont, Ohio, maker of stampings, forgings, and electronic components . . . **Conveyor Systems Inc,** Chicago, is building an $800,000 office and plant in Morton Grove, Ill . . . Also in Morton Grove, **Radiant Mfg Co,** Chicago, is leasing an $1.8-million plant . . . **Sipp-Standard Corp,** Akron, Ohio, is

setting up a tool and die shop, in Wheaton, Ill . . . **Lewis J Purdy,** formerly VP of Chrysler's Dodge Division, has set himself up as an industrial consultant (specialty: stampings) at Royal Oak, Mich . . . **Caster Mold & Machine Co,** Barberton, Ohio, has bought out **Akron Metal Sales Co,** Akron, Ohio, maker of rural mail boxes . . . Operations at **Chevrolet's** Toledo transmission plant may be shifted to Muncie, Ind.

West . . .

Western roundabout . . .

GM's Buick-Olds-Pontiac Assembly Division is back in full production after settlement of a 17-day UAW strike at the Maywood, Calif, plant. Retooling for '57 models will be delayed about two weeks, production will be underway by end of the month . . . Stockholders of **Topp Industries,** Los Angeles producer of electronic components, valves, and aircraft parts, have approved acquisition of **Heli-Coil Corp,** Danbury, Conn, maker of patented thread inserts and precision tools . . . **Harvey Machine Co** has formed a new Aluminum Structures Division, will fabricate parts comparable in size and cost to structural steel on its 8000 and 12,000-ton extrusion presses. Division will be headquartered at the plant near Los Angeles . . . **Pacific Airmotive Corp** has received the first Sabre Jet overhaul and modification contract to be awarded by the Air Force to a private maintenance company, plus an AF contract for overhaul of 497 helicopter engines. Jet work will be handled at the Chino, Calif, division, helicopters at Burbank . . . **Helipot Corp,** Newport Beach, Calif, subsidiary of Beckman Instruments, and manufacturer of precision potentiometers, is marketing (under the Beckman label) breadboard parts, a new product line recently acquired from Belock Instrument Corp . . . **Boeing Airplane** of Seattle has received an order from Qantas Empire Airways, Ltd, of Australia for seven Stratoliners, increasing the number of jet transports now on order from the company to 99 . . . **Walworth Co,** valves and fittings manufacturer, has acquired all outstanding capital stock of **Grove Valve & Regulator Co,** and **Grove Controls, Inc,** both of Oakland, Calif . . . **Hughes Aircraft,** Culver City, is awarding fellowships (MS) to 200 young engineers and physicists from 36 states. Recipients will take advanced courses at four California universities, plus Purdue and West Virginia, while they are working at Hughes in research and development work, will receive professional salaries as well as payment for tuition, books, and fees . . . **Aircraft Engineering & Maintenance Co** has doubled the size of its Oakland, Calif, plant, just received Air Force jet plane overhaul contracts totaling $9.3 million, added another 300 workers (now 1700) to fulfill commitments which will carry the firm through December 1957 . . . **Yale & Towne Manufacturing Co** has started construction of a 100,000-sq-ft plant in San Leandro to manufacture lift trucks. Facility, to employ 400 workers, will be in operation early next year.

South . . .

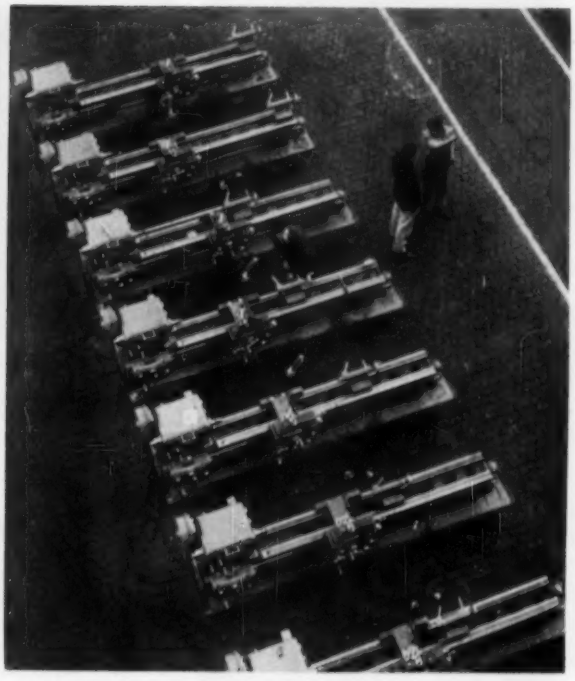
Dixie briefs . . .

Dresser Industries, Dallas, has imported 40 Russian turbo drills; they'll be examined, tested, and evaluated. Company expects to incorporate some design features into an improved Dresser turbo drill being readied for field tests next year . . . **Olin Revere Metals Corp** will build a $50-million alumina processing plant at Burnside, La. Expected capacity, 345,000 tons per year on a 24-hr basis . . . New company (unchristened to date) will soon settle in Alabama City; it'll design, engineer, and manufacture standard and special tools and dies . . . Work on a new $2-million high-altitude test facility for aircraft systems, parts, and equipment is scheduled to begin this month at the Forth Worth, Texas, plant of **Convair Division** of General Dynamics . . . **Proctor & Gamble** will set up a $40-million chemical dissolving pulp production plant at Foley, Fla . . . **Glenn L Martin Co** has purchased a 10-sq-mile tract of land near Orlando. It'll be used to fill company's commitments in electronics, nucleonics, missiles, piloted aircraft . . . **Lithonia Lighting Products Co** will build a 109,000-sq-ft plant in Lithonia, Ga. Production of fluorescent lighting fixtures will be tripled . . . **GM's Chevrolet Division** has acquired an 82-acre site northeast of Atlanta in Doraville, Ga, for a 280,000-sq-ft major supply depot.

"Keep 'Em Rolling" Shipping Line . . .

STOP-AND-START ORDER FILLING has been completely eliminated by this shipping line designed by Browne & Sharpe's engineering and stock room people. All goods are picked from shelves paralleling the conveyor that runs through the stock room and shipping areas. They are placed on either side of a center stripe on the conveyor. Those on one side are ultimately deflected off to the parcel post packing area, on the other to freight and express packers. Entire operation is nonstop from start to finish

ENGLAND: Continuous billet casting . . .
Higher continuous casting speeds than have ever before been attained are claimed for this pilot plant of Barrow Steel Works Ltd—200 ipm of mild steel billet, the equivalent of 7 tons of 2-in. square steel billets per hr



YUGOSLAVIA: Lathes for Chile . . .
A row of lathes await shipment to Chile at the Prvomajaska Machine Tool Factory near Zagreb, Yugoslavia. Built since World War II, Prvomajska employs 1700 workers, makes lathes, drilling and grinding machines

WORLD NEWSBRIEFS

(McGraw-Hill World News) . . .

Japan wants to help **India** develop its medium and small industries, has sent its Machinery Industry Mission over there to talk it over . . . **Sweden** is trying to market its Volvo automobile in **England,** recently displayed a $5600 sports model at London's Commercial Motor Show . . . Ford-Werke, Cologne, **Germany,** has authorized the **Philippines'** Manila Trading & Supply Co to assemble and sell Ford "Taunus" station wagons and Ford V-6 diesel engines in Manila. First components deliveries are expected there in December . . . **Russia** has invited nine **British** technical school faculty members to come over on a 12-day visit to inspect its technical education methods . . . **France's** industrial output stands at an all-time high. It has more than doubled in the post-war decade—with one of the biggest output jumps registered by the automotive industry . . . **Germany's** Adlerwerke has been licensed by Chicago's Borg-Warner Corp to make its automotive overdrives . . . **Japan** is shipping some 500 tons of wire rope to **China** in exchange for 400,000 tons of coking coal . . . **Britain's** Free Piston Engine Co is already turning out 10 small free-piston engine compressors a month, also has orders for two 1000-hp gasifiers and a 3000-hp marine free-piston propulsion unit . . . United States and seven European countries have already booked space for **Canada's** 1957 Industrial Tool & Production Show, to be held in Toronto next May 6-10 . . . **Poland** has ordered 100 delivery vans and 100 family sedans from **England's** Standard Motor Co . . . **Union of South Africa** is loosening up its import controls to allow more automobiles in from **Britain** . . . **Germans** have come up with a new way of cutting down acid losses during pickling of sheet, wire and tube-rolling. It involves extraction of monohydrate $FeSO_4 \cdot H_2O$ directly from the pickling solution . . . Some 37 **Japanese** industrial firms have joined in a Technical Cooperation Company designed to promote technical cooperation between Japan and foreign countries, particularly **Southeast Asia.** In those countries, the company will survey opportunities for expansion in such fields as aircraft, automotive, machine tool manufacture and shipbuilding . . . **Switzerland's** Maschinenfabrik Gebr Sulzer AG has ordered one of the world's largest medium-frequency induction melting furnaces from **Germany's** AEG Elotherm . . . Direct **British** exports to **Russia** may reach $70 million this year, as against $64 million in 1955, but they still have a long way to go to reach the $2.8-billion annual trade total Russia would like to see within five years . . . New York's Combustion Engineering Co will help **India's** Indian Textile Machinery Corp Ltd in the manufacture of water-tube boilers . . . **Australia's** largest manufacturing combine, Broken Hill Proprietary Ltd, expects to spend $225 million on expansion within the next five years —mainly on steel-producing equipment. Almost all of the machinery and equipment will be imported.

A H d'Arcambal (see below)

E P Gillane (see below)

John Jeppson, has been named vice president, general manager, and director of manufacturing of Norton Co's new Abrasive Div. He was formerly vice president in charge of manufacture of abrasive and refractory products (additional appointments below)

Names in the News . . .

Alexander H d'Arcambal, president and general manager of Pratt & Whitney Co, Inc, West Hartford, Conn, will retire on Nov 1 after 37 years of active duty with the company. He will continue, however, as a consultant and as honorary chairman of the board of directors. **Edward P Gillane,** executive vice president and a director of Pratt & Whitney, will succeed Mr d'Arcambal as president and general manager. He also will take over from Mr d'Arcambal as chairman of the board of Potter & Johnston Co, Pawtucket, RI, Pratt & Whitney subsidiary. **Mr d'Arcambal** is a chemical engineering graduate of the University of Michigan and first came to Pratt & Whitney in 1919 as chief metallurgist, after having been with Dodge Brothers as chief chemist, and Wright-Martin Aircraft Corp as chief metallurgist. He was made sales manager of Pratt & Whitney in 1927, a vice president in 1941, and vice president, general sales manager, and a director in 1950. In 1954 he was elected president of Niles-Bement-Pond Co, and general manager of its Pratt & Whitney division, retaining those positions when the company name was changed to Pratt & Whitney Co, Inc, subsidiary of Penn-Texas Corp. Mr d'Arcambal has been national president of the American Society for Metals and national president of the American Society for Tool Engineers. A native of Tipperary, Ireland, **Mr Gillane** was educated in Bridgeport, Conn, and lived there for many years. Before joining Potter & Johnston in 1948 as vice president and controller, he had been associated for 27 years with the Underwood Corp in many important executive positions. He was named vice president and general manager of Potter & Johnston in 1950 and became president in 1955. In June 1956 he was elected executive vice president of Pratt & Whitney.

Ralph M Johnson, vice president in charge of sales of abrasive and refractory products, Norton Co, has been named vice president and director of sales for the company. **Duane E Webster,** manager of diamond products, has been appointed assistant to the director of manufacturing, Abrasive Division. **Frank G Gifford,** manager of wheel plants, has been named manager of the division. **David Reid, Jr,** manager of abrasive and bond plants, has been appointed factory manager.

John R Mazza, chief engineer of Bart-Messing Corp, Belleville, NJ, has been promoted to manager of manufacturing.

William F Wilson (left), vice president, engineering and manufacturing, of Gear Grinding Machine Co, Detroit, has been appointed executive vice president. **William J Taylor** (center), has been named vice president and general manager of Republic Gear Co, a subsidiary. He was formerly vice president, administration, at Detroit Bevel Gear Co, also a subsidiary. **Fred F Miller** (right), vice president, operations, and director of engineering at Detroit Bevel, has been appointed vice president of that company

Phillip Delmer has been appointed manager of hydraulic press sales for Clearing Machine Corp. He has been serving as press specialist with Clearing's distributor, Germain-Moore, Los Angeles

Carl O Newton (left), general sales manager of L S Starrett Co, has been named vice president and director of sales to succeed **William J Greene,** who has retired. **Cortland A Bassett** (right), associated with the company since 1946, takes over Mr Newton's post

W W Gilmore has been elected a vice president of Minneapolis-Honeywell Regulator Co. He is president of the company's Micro Switch Division, Freeport, Ill, and will continue to hold that post.

Jay B Srybnik has been elected vice president of S & S Machinery Co, Brooklyn, NY. He has been serving as New York sales manager and head of the machine tool rental division.

George Karian has been appointed manager of the Tabletting Division of F J Stokes Corp, Philadelphia. He has been serving as sales specialist for the company's powder metal and compacting presses.

Phillipp Hall, sales engineer for A Schrader's Son Division of Scovill Manufacturing Co, Brooklyn, NY, has been appointed industrial sales promotion manager.

Wilbur H Peter, Jr, has been elected a vice president of Square D Co, Detroit, and will become manager of the Electric Controller Division in Cleveland. Previously divisional works manager, Mr Peter succeeds **Alvin C Dyer,** who is retiring.

R D Jones, former assistant general sales manager for Lewis-Shepard Products, Inc, has been appointed general sales manager of the Automatic Transportation Co, Chicago. He succeeds **George A Hinckley,** named manager of the New York sales and service branch.

Ray C Conner, sales manager, automotive products, Vickers Inc, Detroit, has been named general manager of the newly created Automotive Division. **John H Baer,** application engineer for automotive products, will assist Mr Conner as sales and service manager.

OBITUARIES

Joseph W C Bullard, Sr, 74, retired vice president and a director of The Bullard Co, died Sept 16. He was the last of five sons of Edward Payson Bullard, Sr, founder of the company. At the time of his death he was vice president of J W Bullard & Sons, Fairfield, Conn, machine company which he formed after his retirement in 1947

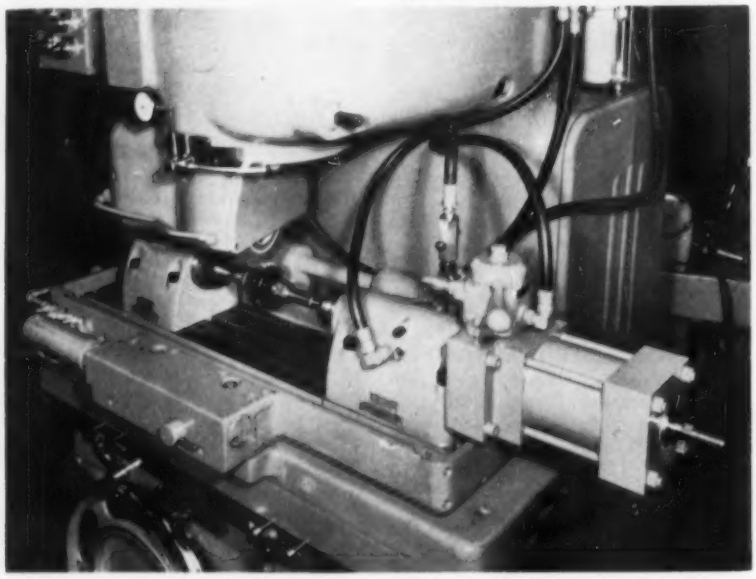
Frederick A Fielder, assistant to the general manager of Loewy-Hydropress Div of Baldwin-Lima-Hamilton Corp, has been named general sales manager of the division

Byron E Coon, manager of sales promotion and merchandising for Rockwell Manufacturing Co's Delta Power Tool Div, has been appointed general sales manager for the division

Joseph M Schaeffer, 71, president of Waterbury Farrel Foundry & Machine Co, died Sept 7. An authority in the field of cold-process bolt, nut, and screw machinery, Mr Schaeffer had been associated with the company for 51 years

New Shop Equipment,

RED RING GEAR HONE, Model GHB, is arranged for manual loading of automotive-transmission helical gear



SELF-ADJUSTING TABLE ARRANGEMENT on Model GHB has air-powered tailstock mounted on tilting table that is attached to the reciprocating worktable through a hinged mechanism at rear. Head and tailstock can be lowered automatically or manually for loading gear into mesh with honing tool

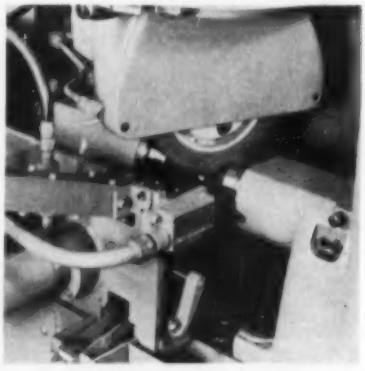
Red Ring Honing Process Improves Hardened-Gear Sound Qualities

The sound qualities of running gears are said to be improved by a newly developed Red Ring process (See Cover) that applies honing principles to the finishing of hardened gear teeth. Development is intended to be applied to hardened spur or helical gears with teeth generated in the soft state, heat-treated, and furnished with conventionally ground locating holes. A departure from previous methods of improving gear sound characteristics—such as grinding, burnishing, or lapping—process removes nicks and burrs, improves surface finish, and corrects minor heat-treatment errors in spacing, profile lead, or eccentricity.

Tooth honing is made possible by the development of two high-speed gear hones, which operate in conjunction with a gear-tooth honing tool.

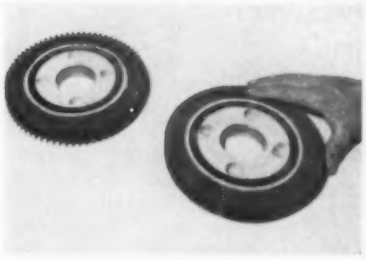
Model GHA, equipped with automatic loader, has tool drive with head- and tailstock spindles that can rotate up to 3000 rpm or more. Work is handled under low backlash conditions, with optional brake loading. Second machine, Model GHB universal gear hone, is used when more tooth correction is desired. With machine arranged for manual or semi-automatic loading, gears up to 8-in.-PD can be honed; with automatic loading, machine accommodates 3-in.-PD gears. Unit also can perform crown-honing operations. Both machines have special high-speed tool drive and mist-lubricated spindles.

Throwaway-type honing tool used with machines is essentially an abrasive-impregnated (SiC in plastic) helical gear that is run in mesh with work in crossed-axes relationship; tool drives work, which traverses back and forth across the tool in a path parallel to its axis. Tool is precision molded and cured by special techniques, so that it does not shrink or warp, and is said to be within 0.0002-in. tolerance on gear-tooth form. Three grit sizes are currently available: 40 for fast stock removal;



ROCKER-TYPE AUTOMATIC LOADER is shown in closeup of Model GHA machine. Finish-honed pinion is in unloading chute at lower left

Materials and Parts . . .



GEAR-HONING TOOLS are abrasive impregnated. Amount of helix angle depends upon helix angle of work gear and amount of crossed-axes angular setting

60 for good stock removal and finish to 25 mu-in. rms; and 80 for 10-mu-in. finish. Tool is molded to shape and is self-regenerating, so that no loading occurs and no dressing is required.

Honing process is designed to remove metal up to 0.002 in. over pins. Cycle of less than one minute is said to smooth surface, remove nicks and burrs, and correct tooth form and lead sufficiently to produce gears of uniform low-sound level. Small pinions are rotated at speeds to 3000 rpm, and larger gears are honed at speeds corresponding to 800 or 900 sfpm at the pitch line. A lubricating-type coolant is used to flush removed metal from the mesh. Method is reportedly adaptable to both high and low gear production, and teeth are not work-hardened, heat-checked, or cracked.

First application is reported to be on a 3-in.-dia Chevrolet second-speed gear for the standard transmission, and most initial applications are expected to be automotive, although marine and aircraft gears have also been successfully honed. The process has not been tried on CI gears.

National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich

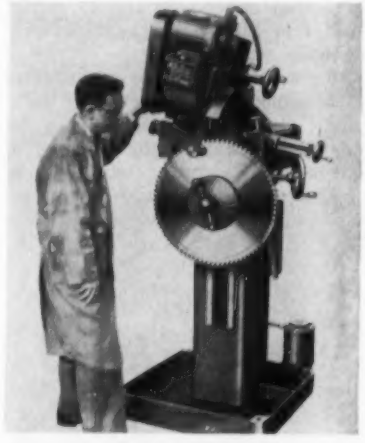
Pastushin Rivet Fasteners Automatically Seal Themselves

Called the Fluid-Tight rivet, fastener is reported to seal itself automatically against fluid or air leaks without use of caulking or rubber sealing agents. Device attains its leakproof seal from a soft aluminum jacket or sleeve around its shank which extrudes, or flows, when the rivet is expanded after driving.

A washered-head rivet developed by the company is used where sealing is required under the rivet head only, and where sealing compounds are used between the attaching skin members.

Rivets are designed for use on automatic drilling and riveting machines and with normal hand tools. Both standard and special-order sizes are available. Company reports successful tests based on 30,000-psi pressures. Brochure is offered.

Pastushin Aviation Corp, 5651 W Century Blvd, Los Angeles 45, Calif



Blade Sharpener Performs Triple-Chip Grind

Model G-45 blade sharpener will handle blades from 8- through 45-in. diameter. Machine features ability to grind alternating high and low teeth with one setting—a triple-chip grind. High tooth is chamfered on either side and the following tooth is square. Narrow tooth roughs out the center and the wide tooth finishes the cut. As a result, three curling chips are formed by two teeth.

Grinding contour is automatically produced by cam action, with index plates controlling tooth spacing. Varying diameters, thicknesses, rake angles, and pitches can be ground.

Motch & Merryweather Machinery Co, 888 E 70th St, Cleveland 5, Ohio

...including

MACHINE TOOLS AND ATTACHMENTS

Reciprocating Gear Grinder 186
Turret-Lathe Drill Attachment 186
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Centerless Turning Machine 188
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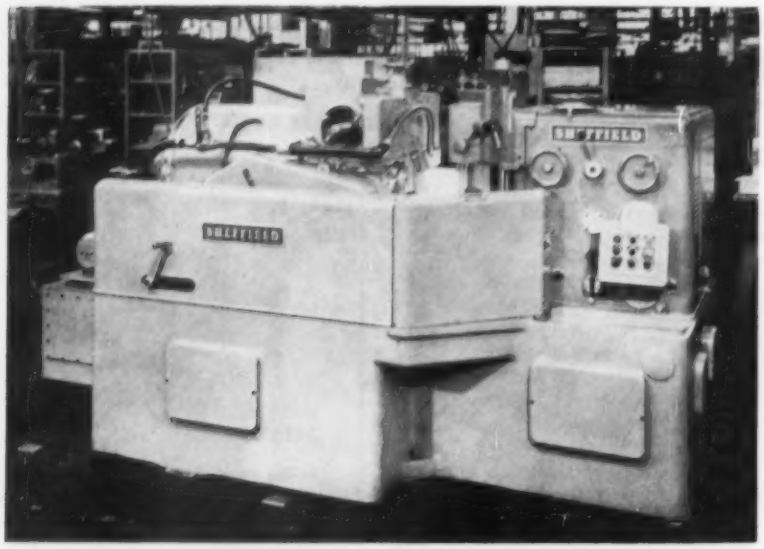


Precision External Gears Are Ground on Sheffield Reciprocating Gear Grinder

Model 140 reciprocating precision gear-grinding machine is designed for grinding external precision spur gears and both right- and left-hand helical gears from 8 to 100 pitch. Machine, which underwent a two-day series of tests in mid-August before defense officials and producers for the armed forces, is engineered to grind gears used in precision instruments, fire-control mechanisms, aircraft accessory power units, machine tools, and gear-train timing devices. A number of gears of the same type can be ground simultaneously from hardened steel in preformed or solid blanks, or gears can be ground individually.

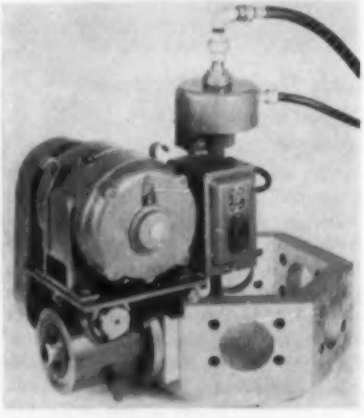
Grinding wheel, size 12 x 5 x ½ to 2 in., is formed to the basic rack form by company's Automatic Crushtrue wheel-dressing process. Gear blank or blanks are mounted in grinding position between head and tailstock centers.

Grinding operation is similar to hobbing, in that the work rotates continuously at a rate of speed synchronized with that of the grinding wheel. Simultaneously the work moves upward past the horizontal center of the wheel until the tooth form is imparted to the full face of the gear blank. In addition to this basic hobbing motion the work rolls across the full face of the helical rack form of the grinding wheel.

Standard model will accommodate a maximum work diameter of 8-in. OD by 5-in. face width. Maximum length between centers is 15 in. Change gears permit number of teeth that can be ground to range from 4 to 192. Other capacities can be made available.

Maximum helix-angle adjustment of wheelhead is 45° right and left-hand. Grinding wheel, which is mounted on a precision pre-loaded ball-bearing spindle, has spindle speed of 2100 rpm; crushing speed is 116 rpm. Machine occupies a floor space of 103 x 132 in., and is 71 in. high. Catalog GG-52.

Sheffield Corp, Dayton 1, Ohio

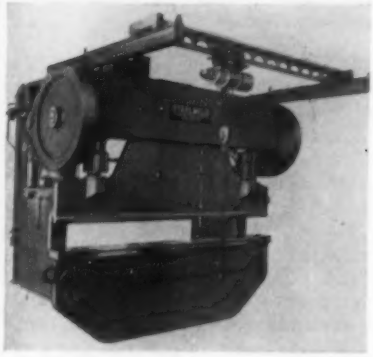


Vilter Drill Attachments Fit Turret Lathes

Models 150 and 150B drilling attachments, designed for use on large turret lathes, are capable of drilling holes up to 1 and 1¾ in. respectively. Each attachment occupies only one turret station, makes possible the drilling of deep holes while other operations are being performed on work. Swivel connections for both power and coolant are provided, so that full indexing of turret is not impaired.

Both models use a 1½-hp motor, single or 3-phase. Drill sleeves for No. 2, 3, and 4 Morse taper and straight-bore sleeves for gun drilling are available. Model 150 has speed range of 120, 240, and 480 rpm; range for Model 150B is 30, 60, and 120 rpm. Both models are supplied with or without motor and starter.

E F Vilter Co, 4161 N Richards St, Milwaukee 12, Wis



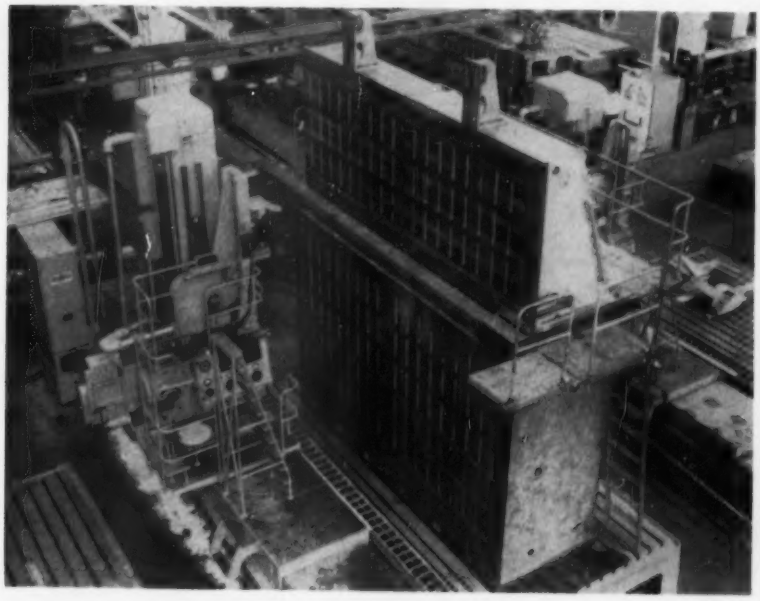
BUILT IN CRANE for handling heavy plates from company's Steelweld press brake is 18 ft long and can be traveled as far as 8 ft to the front of bed center. Three-ton hand-propelled unit has an electric hoist—*Cleveland Crane & Engineering Co, Wickliffe, Ohio*

Automatic Feed, Twin Spindles Double Hand Mill Production

US hand mills equipped with a 12-in.-stroke air-hydraulic table feed and a new 2-spindle head are said to be capable of doubled production capacity. Two vises or other workholding fixtures may be mounted on the table so that two or more pieces can be milled during each complete pass.

The 2-spindle head can also be adapted to the company's hand or power table feed millers. Lower spindle is mounted in fixed position; upper may be raised or lowered to handle various sizes and types of work, and to compensate for cutter wear.

US Burke Machine Tool Division, Cincinnati Manufacturing Corp, Cincinnati 27, Ohio



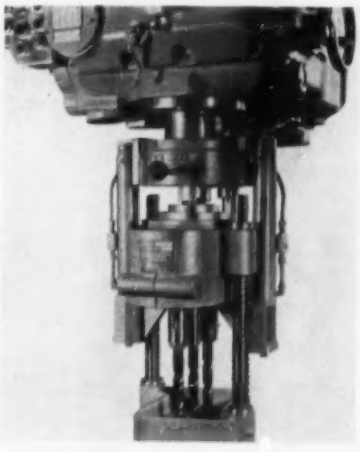
Tracer-Controlled Keller Miller Mills Large Aircraft Forgings

Giant 73-ton automatic tracer-controlled milling machine built for Douglas Aircraft Co in Santa Monica, Calif, will be used to mill forgings for jet-powered aircraft. Machine, designated Type BG-22, has a horizontal travel of 14 ft and vertical travel of 7 ft. It is a single-spindle model.

Machine's fixture, fabricated by Avery & Saul of Cambridge, Mass, weighs approximately 60,000 lb, and is of weldment construction to meet rigidity requirements caused by increased horsepower and a considerable increase in speeds and feeds of the machine. Fixture consists of two lower sections bolted together, each 7 ft wide by 9 ft 8 in. high and 4 ft 6 in. deep. Upper fixture bodies consist of two separate sections, each 7 ft wide, for mounting the model, and can be adjusted transversely by rack and pinion. A spacer located between upper and lower fixture bodies permits this transverse adjustment and is also used to tie fixture to the column. This tie consists of a support bracket and an adjustable arm with slider, all of which is fastened to the moving column.

Slider moves in a groove provided in the fixture spacer between upper and lower fixture bodies, so that machine is effectively tied to fixture during travel and machine's ability for heavy cutting is increased. Fixture stands 16 ft high above machine table; front plate of lower fixture is 3 in. thick.

Pratt & Whitney Co, Inc, West Hartford 1, Conn

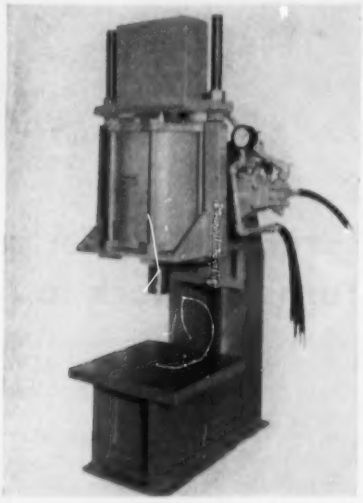


Drillhead Attachment Combines Swivel and Air Counterbalance

Combination swivel and air-counterbalance attachment makes it possible to adapt large multiple-spindle drill and tapping heads to radial drilling machines. Two cylinders are employed which maintain a balanced condition of the head on the machine. Air in the counterbalancing set-up is controlled on both ends of the stroke; therefore, only sufficient pressure is maintained to counterbalance weight of the head during all portions of the stroke. On the return stroke, air is controlled to prevent extreme, quick return of the head. With this attachment, an air filter, pressure regulator, and air oiler are furnished.

Special radial-drill-mounting attachment incorporates a 360° swivel, which enables entire drillhead to be properly aligned. Fixed-center head and adjustable head operate equally well with the attachment.

U S Drill Head Co, 616 Burns St, Cincinnati, Ohio



Heavy-Duty Air Arbor Presses Offered in Sixteen Models

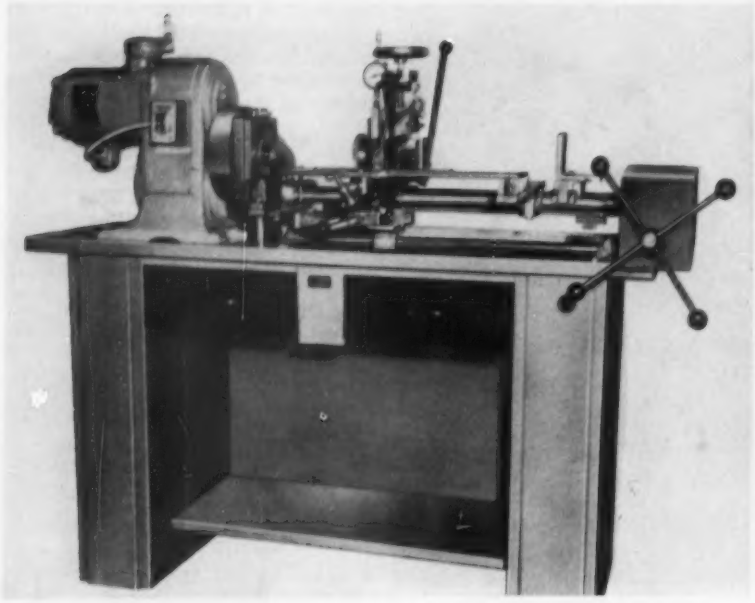
Line of air arbor presses called Vi-Speed is available in 16 models, ranging from 1 to 5 tons, either hand or foot controlled. Units have up to 6¾-in. throat clearance with adjustable ram clearance up to 12 in. Any stroke between 2-in. minimum and maximum ram clearance is available.

Presses can be used for such jobs as riveting, forming, bending, and press-fitting. Units up to 2 tons have 1½-in.-OD rams; larger units have rams with 2-in. OD. Most rams are keyed for non-rotation.

Line has a special cylinder arrangement; base dimensions are kept at a minimum by stacking cylinders of similar bore sizes to increase the power thrust. On double-acting stacked cylinders, only one cylinder is used for the return stroke, permitting a 25% saving in air consumption.

Presses are equipped with company's Vi-Speed stroke-limit control.

Van Products Co, 5712 Old Ridge Rd, Erie 7, Penna



Turnomat Centerless Turning Machine Turns Barstock to Any Length

Employing a centerless bar-turning technique without the use of centers, steady rests, box tools, or bushings, centerless turning machine can turn intricate shapes, contours, and tapers of infinite lengths in one pass and one plunge cut. Machine handles all grades of steel, copper, brass, aluminum, and plastics or wood from largest barstock diameters to smallest. Work reportedly can be held to tolerance of ±0.0005 in.

One pass with single-point cutting tool can include such cuts as straight 90°, reverse, and straight shoulder-to-shoulder. With a two-position and operation attachment, operator can center drill, light drill, ream, chamfer, and burr.

Machines are built in three sizes: Models 1000, 1750, and 3500 handle maximum barstock diameters of 1-1/16, 1¾, and 3½ in. respectively. Larger production work models can be engineered to customer's requirements.

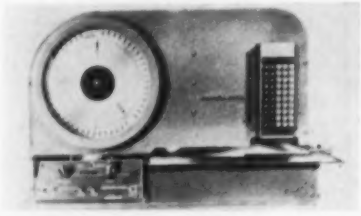
Turnomat Co, Inc, Dept A, Brockport, NY

Collins Surface Plates Are Lapped by Special Process

Seizure of gage blocks and checking fixtures has reportedly been eliminated in line of black-granite surface plates by a lapping method which provides a continuous bearing surface interspersed with micronic valleys. These minute reliefs afford sufficient air-pocket relief between bearing surfaces to prevent seizure. Sub-divisions of the grain patterns are so small that they are invisible to the naked eye.

Surface plates are available in either two-ledge or four-ledge styles and are finished down to fifty-millionths over-all accuracy.

Collins Microflat Co, 3326 E 8th St, Los Angeles 21, Calif



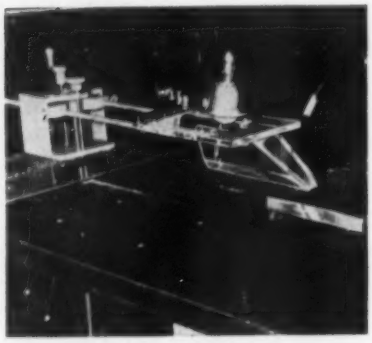
Fairbanks-Morse Scales Incorporate Electronic Weighing

Employing electronic load cells, line of weighing instruments features accuracy, fast weighing, and the convenience of remote weight indication. Two basic types of electronic scales are available: full electronic, in which load cells replace the conventional lever systems; and Levetronic, in which a conventional lever system is used, but with a load cell hooked up in tension in the steelyard rod. Levetronic system can be used to convert existing full mechanical scales to electronic weighing and instrumentation. Weight-recording instruments can be placed 250 ft away.

Model CR (illustrated) has automatic balance detection, hold or memory circuit, automatic ranging, net-gross switch, printer with selective "weigh" and "print" buttons, zero balance knob, and direct-reading tare. Another instrument, Model CDO, is designed for use where data-processing equipment is used, integrating weights and associated data.

In addition to electronic scales, line includes two electronic weigh batch-control systems. One, called the Batchetron, is used for batch weighing of any type of material that can be handled into the batch hopper by piping, conveyors, or belts. Second unit, designated the Electronic Program Control, operates from a pre-punched card.

Fairbanks, Morse & Co, 600 S Michigan, Chicago 5, Ill



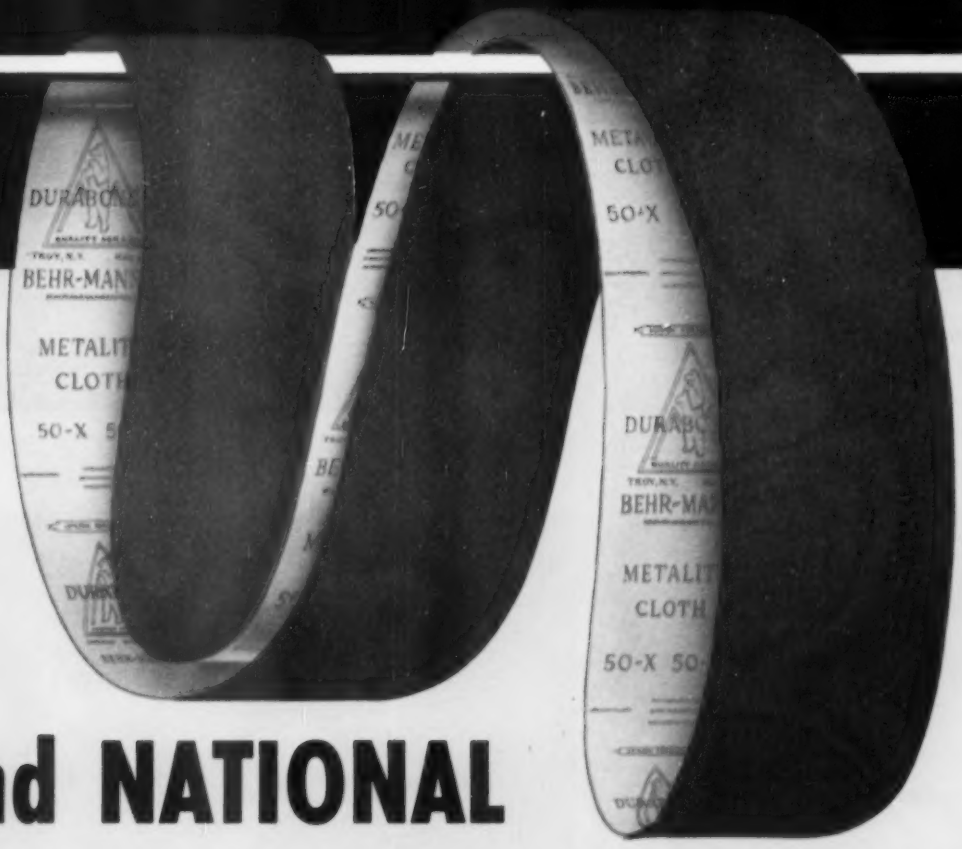
POWER-SAW GUARD, called TenCee, is designed to sheathe revolving circular saw in a transparent shield of heavyweight Plexiglass. Steel arms suspend the shield above the saw blade in a fixed position which permits no rock, sway, or swivel. Clearance between table and shield can be adjusted quickly by a crank handle— ***Brett-Guard Co, 5 W Sheffield Ave, Englewood, NJ***

Fine-feed boring attachment for Hole Wizard radial drills is furnished in addition to standard feeding mechanism. Fine-feed range for precision boring is ¼ the standard range, and supplies six feeds from 0.001 to 0.00625 ipr of the spindle. Change from standard to fine feed is made instantly through lever.

American Tool Works Co, Pearl St at Eggleston Ave, Cincinnati 2, Ohio

BEHR-MANNING

ANNOUNCES...



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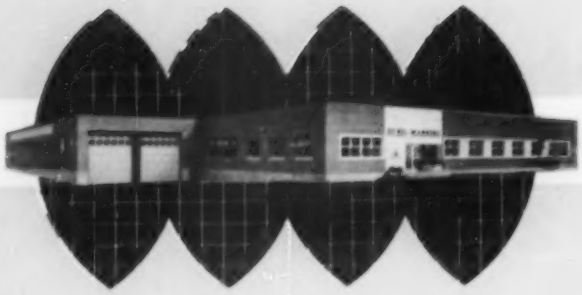

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MACHINES AND ATTACHMENTS

1 BROACHING MACHINES—*Colonial Broach & Machine Co, PO Box 37, Harper Station, Detroit 13, Mich.* 4-page bulletin HM-56 illustrates description of mechanical details and operating advantages of ElectroGear line of horizontal guided ram units. Machine data listed for 12 models with capacities of 10, 15, 20, and 25 tons, stroke lengths from 90 to 240 in.

2 RADIAL DRAW FORMERS—*Cyril Bath Co, 23400 Aurora Rd, Solon, Ohio.* 60-page catalog illustrates and describes line ranging from machines for handling work up to 300 tons, down to semi-automatic units that will produce work for automobile trim at rate of 600 pieces per hr. Three work forming methods discussed: stretch, compression, and radial draw. Press brakes and tangent benders covered.

3 AUTOMATIC GRINDING WHEEL BALANCING — *Cincinnati Milling Machine Co, Cincinnati 9, Ohio.* 12-page booklet G-637-2 contains illustrated information on balancing mechanism incorporated in Filmatic plain, roll, and centerless grinding machines.

4 MICRO POSITIONING SYSTEMS—*Farrand Controls, Inc, 4401 Bronx Blvd, New York 70, NY.* 12-page bulletin 819 gives data on Inductosyn systems. Linear type is an electronic automatic machine tool control capable of positioning carriage with max linear error of 0.0001 in. or positioning a rotational member with max angular error of 5 sec of arc. Rotary type can be used as electro-mechanical dividing head, multi-speed data transmission system, high precision servo, electronic back-lash-free gear ratio, high-speed phase shifter, or angular pick-off accurate to 5 parts per million.

5 POWDER METAL PRESSES—*F J Stokes Corp, 5500 Tabor Rd, Philadelphia 20, Penna.* 24-page catalog 815 illustrates and describes 37-model line, capacities from 1½ to 300 tons, single-punch and rotary types.

6 GRINDERS, POLISHERS, BUFFERS—*Standard Electrical Tool Co, 2488-98 River Rd, Cincinnati 4, Ohio.* 48-page catalog 44 pictures and gives specifications and descriptions of line including snagging, heavy-duty, wet, disk, vertical spindle, internal, external, angle plate, and portable grinders; machine tool attachments; variety of buffers and polishers; and speed lathes.

7 WAY TYPE HYDRAULIC FEED UNITS—*Hartford Special Machinery Co, 282 Homestead Ave, Hartford 12, Conn.* Bulletin, specification sheet, and price list cover new line of standard horizontal and vertical units.

8 VDF STANDARD LATHES—*Seewald Inc, 818 Woodbridge Ave, New Brunswick, NJ.* 19-page brochure illustrates features and provides detailed information on Type E/V (German) models with 18 spindle speeds, 32 feeds.

9 MILLING MACHINE COMPARISON CHART — *Greaves Machine Tool Div, J A Fay & Egan Co, 2100 Eastern Ave, Cincinnati 2, Ohio.* "Slide-Guide" provides comparisons of 21 specifications to be considered in purchasing a milling machine. Gives data on eight leading mills, including table sizes, speeds, feeds, capacities.

TOOLS AND ACCESSORIES

10 SMALL TOOLS & ACCESSORIES —*George Gorton Machine Co, Racine, Wis.* 51-page catalog illustrates and describes lines of cutters, arbors, small tools, rotary tables, vises, chucks, attachments, and accessories, including Master Copy type. Specifications and price list included.

11 "TAP PRIMER"—*Threadwell Tap & Die Co, Greenfield, Mass.* 72-page booklet contains illustrated descriptions, basic information on uses, characteristics, qualities, design, and purposes, tap and thread terminology.

12 PRECISIONAIRE — *Sheffield Corp, Div 610, Dayton 1, Ohio.* 12-page catalog IPC-6-56 covers principles of air-gaging with instrument. Discusses basic tooling for inspecting internal and external dimensions and conditions; types and sizes of adjustable air-gage tooling. Single and multi-dimension applications illustrated.

13 POWERED BACKSTAND—*Grinding & Polishing Machinery Corp, 1530 Winthrop Ave, Indianapolis, Ind.* Bulletin describes specifications and operation of

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14 TOOLHOLDERS & THROW-AWAY CARBIDE INSERTS — *Beely-Welles Corp, 852 Dearborn Ave, S, Beloit, Wis.* 8-page catalog 852C lists complete line of holders and triangular and square inserts.

15 CARBIDE ROTARY CUTTING TOOLS—*Elgin National Watch Co, Abrasives Div, 107 National St, Elgin, Ill.* 8-page brochure covers line of solid carbide end mills, rotary files, and miniature cutters, with applications; tabular data on speed range in surface feet per minute for various metals; cutting speed conversion chart lists cutting head diameters from ⅛ to 1 in.

16 BORING TOOLS — *Moore Special Tool Co, 740 Union Ave, Bridgeport 7, Conn.* 12-page illustrated catalog describes line available in HSS or carbide for use with Moore jig borers. Covers new boring chuck set for boring holes from 5/32 to 5 in.; Microbore bars for precision boring and facing operations.

17 TOOLS—*Cleveland Twist Drill Co, Cleveland, Ohio.* 206-page book, thumb-indexed, covers complete line with application photos. Describes 29 new tools including carbide tipped and solid carbide end mills, die drills, short series straight shank drills in fraction, wire gage, and letter sizes; Mo-Max T-shape cutoff blades; 13 new drill sets.

18 LOOSE DIAMONDS—*Diamond Tool Research Co, 350 Second Ave, New York 10, NY.* 4-page brochure, line-drawing illustrated, describes assortment for specific characteristics. General background information on sizes, uses, and diamond terminology.

HEAT TREATING AND WELDING

19 AUTOMATIC WELDING MACHINES—*Morton Manufacturing Co, Broadway & Hoyt, Muskegon Heights, Mich.* 8-page bulletin 55 contains illustrated descriptions of seam and girth welders, contour and special applications, complete production installations.

20 HEATING ELEMENTS—*Norton Co, Worcester 6, Mass.* 8-page brochure illustrates case histories of application of "Hot Rod" Crystolon elements for electric furnaces and kilns.

21 ALUMINUM DIP BRAZING—*Ajax Electric Co, Frankford & Delaware Aves, Philadelphia 23, Penna.* 8-page illustrated booklet gives details on how salt bath brazing replaced hand welding of aircraft structures with cost savings and elimination of distortion.

PLANT SERVICE EQUIPMENT

22 MATERIALS HANDLING TRUCKS — *Lewis-Shepard Products Inc, Dept 22, Watertown, Mass.* 132-page illustrated, bound catalog contains detailed descriptions of Master-Line models. Sections give specifications and construction features of riding-type electric fork trucks and walkies; stackers and cranes; handlift and floortrucks.

23 CHECKS & TAGS—*Jas H Matthews & Co, 2942 Forbes St, Pittsburgh 13, Penna.* Spiral-bound illustrated catalog contains descriptive and technical data on metal checks, tags, plates, signs, badges, and similar products for identification of wide variety of items.

24 "WHY HOT SPRAY?" — *Spec-Flo Co, 720 Polk, Houston 2, Texas.* Revised, illustrated booklet lists benefits of hot spray application of finishing materials, explains each in detail. Case histories, questions and answers, cover operational data.

25 CRANE OPERATION & HITCHING MANUAL — *Allis-Chalmers Manufacturing Co, Safety Services Section, Box 512, Milwaukee 1, Wis.* 75-page illustrated pocket-size booklet gives rules relating to operation, describes safe hitching equipment and practices, provides safe load tables for various types of slings, shackles, S-hooks, and eyebolts, with instructions for use.

26 ADJUSTABLE ELECTRIC FIXTURES — *O C White Co, 15-21 Hermon St, Worcester 8, Mass.* 23-page 1956 catalog and list price sheet gives details in line of incandescent and fluorescent units; new models include work-area spring-balanced fixtures with finger-tip control and "ultra-flex" arms.

27 SPRAY PAINTING — *Finish Engineering Co, 1115 Cherry St, Erie, Penna.* 30-page catalog illustrates and describes equipment for decorating parts. Discusses best spray gun action, type of mask, etc, for specific items. Screens and painting fixtures, roller coating, and paint-and-wipe technique covered.

PARTS AND MATERIALS

28 "TOOL STEEL HANDBOOK" — *Allegheny Ludlum Steel Corp, 3020 Oliver Bldg, Pittsburgh 22, Penna.* 204-page fourth edition contains complete data on types, properties, and applications. Chapters cover selection, products, working tool and high speed steels, reference tables.

● PRECISION RADIAL ROLLER BEARINGS — *Rollway Bearing Co, 541 Seymour St, Syracuse, NY.* 56-page catalog-manual has tabular information on radial static and dynamic capacities, thrust capacities, load ratings, radial internal clearances, temperature allowances, provision for float, alignments, seals, lubrication. Engineering formulae, graphs, installation drawings included. Request direct on company letterhead.

29 FASTENERS — *Driv-Lok Pin Co, Sycamore, Ill.* 24-page catalog illustrated with line drawings describes features and principle of Driv-Lok grooved fasteners. General specifications, variety of types covered with standard sizes; drilling procedure and hole tolerances; typical applications; standard and special studs.

30 "MARBLETTE DIGEST OF PLASTIC TOOLING" — *Marbiette Corp, 37-31 Thirtieth St, Long Island City 1, NY.* 8-page booklet discusses applications, advantages, construction methods including casting, laminating, and combination of both; resin selector chart; tooling plastics described; curing methods and hardeners covered.

31 OPEN DRIP-PROOF MOTORS — *Allis-Chalmers Manufacturing Co, 992 S 70th St, Milwaukee 1, Wis.* 6-page illustrated bulletin 51B6210G describes design features of units in NEMA rerated ratings of ½ to 40 hp (Type G) and in non-rerated ratings of ½ to 100 hp (Types AP and APWW). Included are tables of ratings and dimensions as well as horsepower frame chart.

CHIPS DISSTON SAYS

"Be a Sharp Buyer!"

Choose the new DISSTON *Lancer Tooth Band Saw*

FOR HIGH-SPEED CUTTING OF NON-FERROUS METALS

LANCER TOOTH

Use this newly designed Disston hard edge blade with positive rake angle tooth. It permits high-speed production cutting of non-ferrous metal, wood and plastic—cuts brass and aluminum solids and Plexiglas with equal ease.

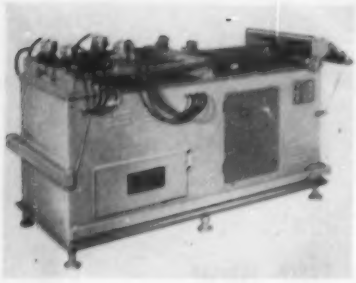
REGULAR TOOTH

Use this fine Disston hard edge flexible back band saw for all ferrous metals and the thinner sections of non-ferrous metal, wood and plastic. Its finer tooth spacing is particularly adapted to sawing angle iron, steel tubing, nickel plate and brass sheets.

Contact your Disston distributor for these and other high quality Disston cutting tools. Get his expert advice on selecting the right tool for your application.

Henry DISSTON DIVISION
H. K. PORTER COMPANY, INC.
1020 Tacony, Philadelphia 35, Pa.

HKP DISSTON



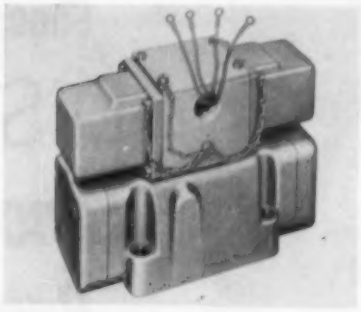
Sesmatic Press Gripper Feed Operates Hydraulically

No. FC-3232 heavy-duty punch-press feed will handle stock 32 in. wide, 0.250 in. thick, and offers a maximum stroke length of 32 in. Hydraulically operated unit is equipped with feed cylinder and other hydraulic components. Cylinder has 2½-in.-dia bore with stroke infinitely adjustable to 32 in.

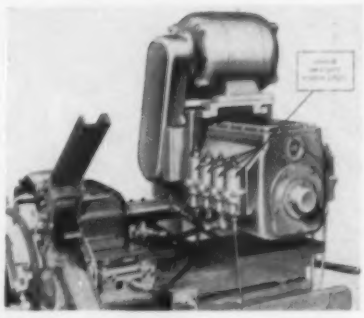
Unit will operate under 500 psi in the hydraulic system. At this pressure, a force of 2400 lb pulls the stock through the feed; gripping pressure on stock is about 12,000 lb. These pressures can be increased or decreased by changing pump pressure.

Timing of feed with press is accomplished by means of a limit switch, so mounted that when the ram goes up, switch makes contact and energizes the solenoid of a 4-way valve, causing gripper heads of feed to grip stock and move forward on their feed stroke. When limit switch breaks contact, gripper heads release stock and return to back position.

Special Engineering Service, Inc, 8161 Livernois Ave, Detroit 4, Mich



HYDRAULIC CONTROL VALVES in Logan 9700 Series operate to 3000 psi, have continuous-duty solenoids, and are available in several types in range of sizes from ⅛ to 1¼ in. Company also offers 1500-lb hydraulic valves in range from ¼ to 1 in., as well as 2000-lb hydraulic cylinders in seven bore sizes from 1½ to 6 in. with max stroke of 72 in.—*Logansport Machine Co, Inc, Logansport, Ind*

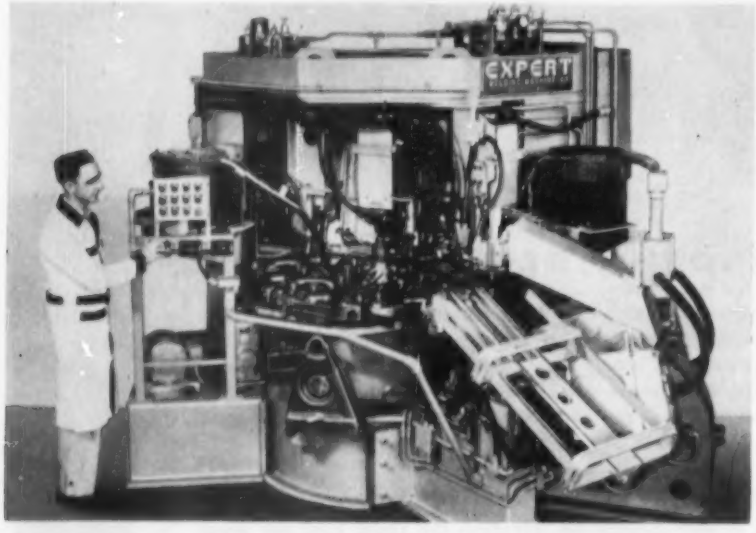


Multiple-Circuit Hydraulic Power And Sequence Control Device

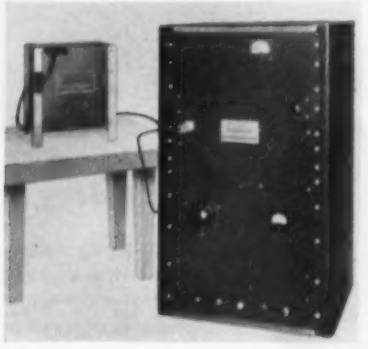
Hydra-Cam consists of a series of hydraulic power cylinders, each connected to an individual closed hydraulic circuit. Each cylinder is equipped with a power piston driven by one of a series of cams mounted on a common shaft. Cam shaft is powered through a two-speed transmission.

Any timing and sequence or overlapping of motions is obtainable, as well as any length of stroke within power cylinder limitations, by varying the characteristics of the individual cams. Any type motion can be produced, such as constant velocity, or harmonic. Cycles can be as fast as 1 per sec. Two-speed drive provides for both work and idle cycles.

Earl A Thompson Manufacturing Co, 1300 Hilton Rd, Ferndale, Mich

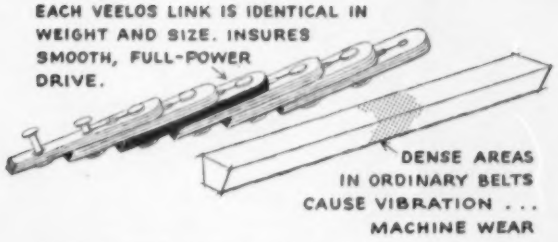


AUTOMOTIVE SUSPENSION-ARM ASSEMBLIES are processed by special 7-station rotary-index projection welding machine, which welds two T-nuts, three weld nuts, and a steering stop bracket to the assembly at a rate of 400 per hr. Machine features stop-and-start cam-drive mechanism that controls index and weld sequences, bowl feeders equipped with hopper feed tracks, transfer device for delivering weld nuts to welding guns, and special mechanism for projection-welding the brackets. Unit is 8 ft high, occupies 9 x 10-ft floor space —*Expert Welding Machine Co, 17144 Mt Elliott Ave, Detroit 12, Mich*

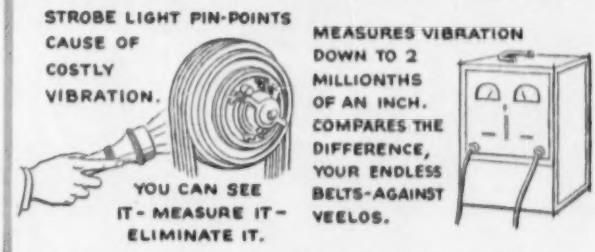


ULTRASONIC SOLDER POT is intended for fluxless dip soldering of aluminum and copper wire and foil, tube bases, cans, germanium, and silicon as well as ordinary dip-solder operations where corrosive fluxes cannot be tolerated. Standard unit consists of a 1-kw electronic generator operating in the 12-to-50-kc range and a 9 x 9-in. oil and water cooled solder pot with thermostat control. Unit sells for $3000 fob—*Alcar Instruments, Inc, 17 Industrial Ave, Little Ferry, NJ*

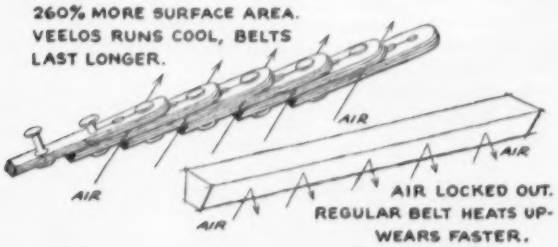
Six Reasons Why Veelos Adjustable V-Belts Are Better For Your Drives!


EACH VEELOS LINK IS IDENTICAL IN WEIGHT AND SIZE. INSURES SMOOTH, FULL-POWER DRIVE.
DENSE AREAS IN ORDINARY BELTS CAUSE VIBRATION . . . MACHINE WEAR

1. Balanced construction of Veelos Belts assures you faster, cleaner work, less rejects . . . less bearing wear. Each link and stud is identical in size and weight. Ordinary belts have varying spots of density which cause excess vibration—chatter marks, machine wear.


STROBE LIGHT PIN-POINTS CAUSE OF COSTLY VIBRATION.
YOU CAN SEE IT - MEASURE IT - ELIMINATE IT.
MEASURES VIBRATION DOWN TO 2 MILLIONTHS OF AN INCH. COMPARES THE DIFFERENCE, YOUR ENDLESS BELTS-AGAINST VEELOS.

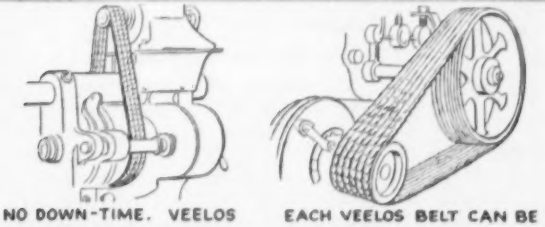
2. Electronic proof—up to 90% less vibration! With a vibration analyzer, you see, on your own machine, how Veelos belts decrease vibration up to 90% over any belt you're now using. This amazing Veelos test pin-points the belt that has the "invisible shakes."



3. Cooler running—long life! Veelos breathes! Constant circulation of air keeps Veelos running smooth. Regular V-belts have no chance to cool, heat builds up from the inside . . . causes slippage, wastes power, heats bearings, reduces belt life.

AREA CONTACT
POINT CONTACT
PERFECT VEELOS FIT. EXTRA THICKNESS AND MACHINE-CUT SIDES PREVENT BOTTOMING. MEAN CONSTANT POWER.
POWERLESS POINT CONTACT OF ORDINARY V-BELT. BULGES, SLIPS, CAUSES UNEVEN SHEAVE WEAR.

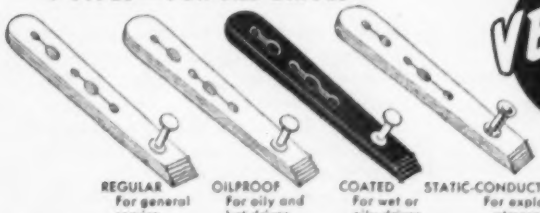
4. Greater flexibility reduces slippage! Sectional construction, beveled links allow greater flexibility, longer belt life. Each link moves around sheave independently and maintains full contact, constantly. Full area contact allows shorter centers, smaller sheaves.


NO DOWN-TIME. VEELOS FITS ANY DRIVE - WITHOUT DISMANTLING.
EACH VEELOS BELT CAN BE ADJUSTED - NO NEED FOR EXPENSIVE MATCHED SETS.

5. Simple installation "knocks out" down-time! Saves up to 50% installation time on outboard bearing drives, more when belt length isn't in stock. No resetting, tilting or moving motors. Veelos can be made any length, can be changed by adding or removing links.

6. Veelos won't stretch any more than ordinary endless V-belts when it is properly installed. *Remember—measure Veelos 1" short per foot and roll on drive as tightly as possible.* With the first few revolutions Veelos studs accept a permanent set into the sections they connect.

4 TYPES—FOR ALL DRIVES


REGULAR For general service
OILPROOF For oily and hot drives
COATED For wet or oily drives
STATIC-CONDUCTING For explosive atmosphere

VEELOS
THE BALANCED LINK V-BELT
Known as Veelink outside U.S.A.

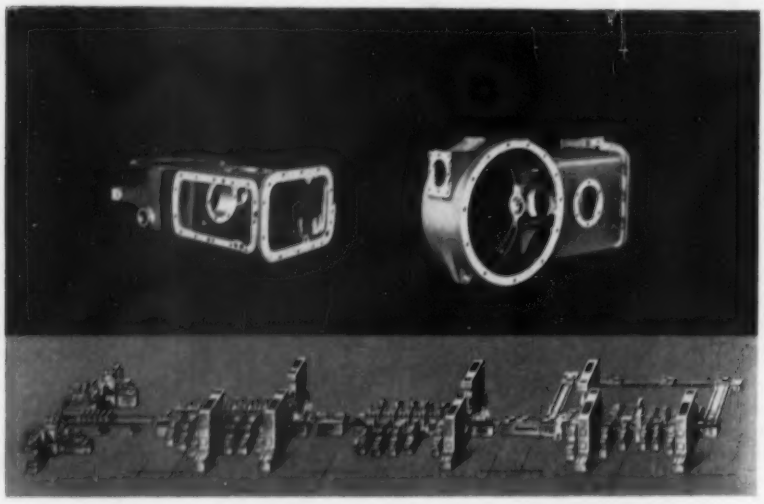
For all sizes and types of drives. Double-V available for serpentine drives.

Write for free Veelos Data Book or Veelos Vibration Demonstration to:

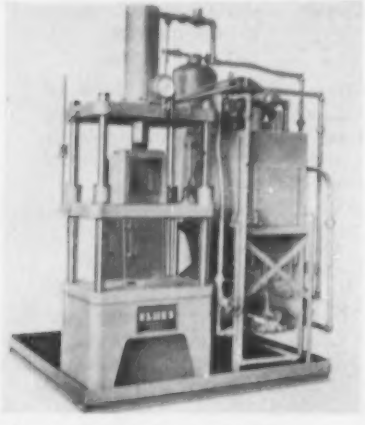
MANHEIM
Manufacturing & Belting Co.
401 Stiegel St., Manheim, Pa.

"Industrial Belt Specialists Since 1911"

© M.M.&B. Co. 1956



TRACTOR DIFFERENTIAL CENTER HOUSINGS are machined at the rate of 46 per hr on sectionized line of three Transfer-matics and two precision boring machines. Line, which is 32 ft wide and 225 ft long, consists of 31 stations divided into four sections: first machines top and bottom of housings; second, the two sides; third, the ends; fourth finishes the bores. 313 operations are performed, including 19 milling, 7 cross-facing, 110 drilling, 17 boring, 72 chamfering, 4 spotfacing, 8 reaming, and 76 tapping—*Cross Co, Detroit, Mich*



Elmes Die-Casting Press Has Special Automation Features

Custom-engineered hydraulic die-casting press is an accumulator-operated unit designed for casting motor rotors by dunking into a pool of molten aluminum. Entire machine is an integral unit consisting of press, accumulator, pump, valve subplate, and control panel, all mounted on a common baseplate. Hydraulic circuit is designed for pushbutton operation.

Using his own tooling, operator ladles in the molten aluminum and closes safety door which initiates press cycle. Both loading and unloading are automatic.

Elmes Engineering Div, American Steel Foundries, 1150-A Tennessee Ave, Cincinnati 29, Ohio

DRAGLINE TRUCKS with welded-steel framework are offered with standard deck heights ranging from 7½ to 14 in. Wheels may be steel, plastic, or rubber-tired. Replaceable hardwood deck is lightweight, provides non-slip carrying surface. Blackboard and bill holder are optional—*Howe Scale Co, Rutland, Vt*

Whitney Chain Introduces New Magnetic Drives

Whitney Chain Co, under licensing agreement with Tormag Transmissions, Ltd, Canada, is manufacturing the Whitney-Tormag Magnetic Drive designed to provide a flexible slip-type drive between a motor and its load in a range from fractional to over 50 hp. Cylindrical design is adaptable to the new, smaller NEMA frame specifications, permitting the unit to be smaller in diameter than an electric motor of similar horsepower.

Drive consists of two component parts: a cylindrical magnetic rotor to which are attached Alnico V permanent magnets, and a bimetallic rotor, a copper-faced, mild steel plate or cylinder perforated with steel rivets. The two rotors are mounted face to face with an air space between them. If either of the rotors is driven, a torque is induced in the other through eddy currents, with the permanent magnets supplying the necessary magnetic flux. Driving and driven rotors are never in contact.

Whitney Chain Co, Hartford, Conn

Lombard Billet Heater Is Pushbutton Controlled

No shutdown or warmup time is necessary with this induction billet heater. Heat is instantaneously turned on or off. Entire furnace operation is controlled by one push-button; only two limit switches are used in accomplishing the automatic cycling operation. Coils are cooled by water paths that are individually protected.

Average furnace with a 2000 lb per hr aluminum heating capacity requires only 40 sq ft of floor space.

Lombard Corp, 639 Wick Ave, Youngstown, Ohio

Plastic blow gun, No. 560, features simplicity and durability of parts, free flow of air, functional design with comfortable grip, and light weight. Parts are quickly replaceable and interchangeable. Tool is available in ¼-in. thread size.

A Schrader's Son, Div of Scovill Mfg Co, Inc, 470 Vanderbilt Ave, Brooklyn 38, NY

In just .02 of a second the Ross Comet II completes a valving cycle—both energizing and de-energizing! This solenoid operated, balanced spool, 4-way is light and compact. Built to JIC standards, the ¼" or ⅜" Comet II converts to scores of different uses!

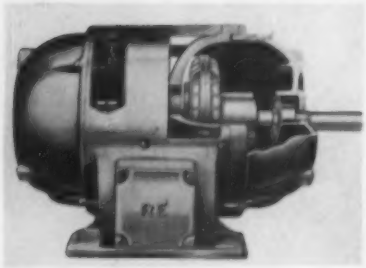
Write for bulletin 314.

Ross

• • • EnginAIRed Circuitry • • •

OPERATING VALVE COMPANY

122 E. GOLDEN GATE AVE. • DETROIT 3, MICHIGAN



Reuland Motor Coupling Utilizes Steel Shot

Flexi-Shaft motor line uses steel shot instead of a true fluid in internal coupling, with resulting advantages of smooth load acceleration, protection against equipment jamming, and ability to start heavy loads on low operating horsepower. Coupling is an adaptation of the Dodge Flexidyne drive, and works on principle of centrifugal force throwing the steel shot to perimeter of housing, which in turn is keyed to the load and accelerates as the rotor gradually becomes "imbedded" in the tightly packed shot.

Coupling is mounted inside motor's frame, and entire unit is supplied as a single-frame power package. Motors are produced in ratings from ½ through 15 hp.

Reuland Electric Co, Alhambra, Calif

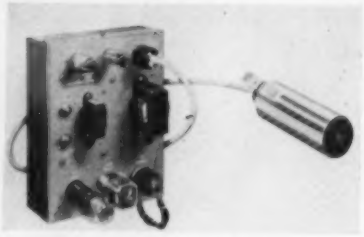
Heavy-Duty Fork Truck Operates in 6-ft Aisles

Battery-powered Type TE-4 Traveloader utilizes side-loading principle, so that it does not have to turn to face its load. Truck has capacity of 4000 lb, can carry and stack in aisles as narrow as 6 ft. Truck is of standup-driver type, utilizes full-sized wheels, automotive-type steering, and hydraulic brakes.

Other features: maximum lift, 130 in.; loaded lift speed, 31 fpm; 5° tilt forward and backward; free lift of 67½ in.; and compartment for standard batteries to 25.20 kwh.

Baker-Raulang Co, Cleveland, Ohio

DIE HANDLER for inclined presses attaches to fork truck, can handle dies weighing up to 6000 lb. Handler works off truck's hydraulic system and is controlled by a portable pushbutton panel. Its table can be rotated 180° horizontally, permitting dies to be loaded or unloaded from any angle of approach. Table also tilts, permitting operator to position and retrieve dies in press inclined up to 45°—*Automatic Transportation Co, 149 W 87th St, Chicago 20, Ill*

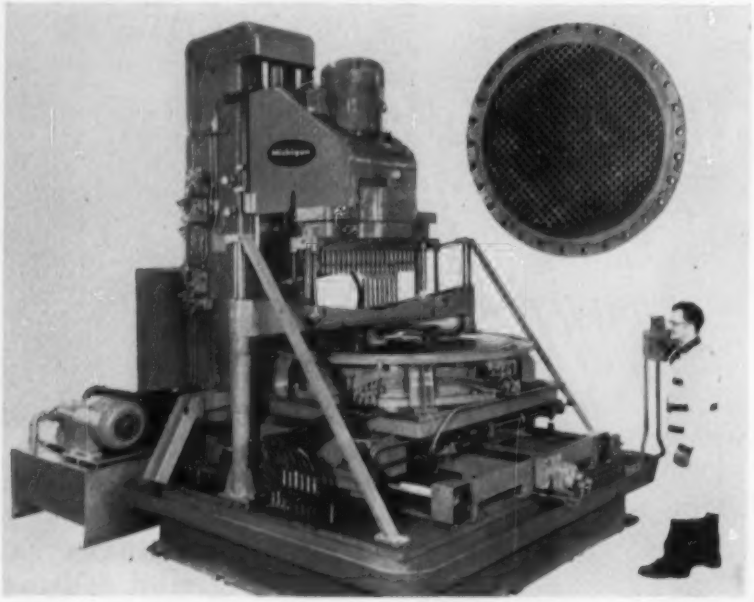


Square D Limit Switch Operates Without Physical Contact

Device known as proximity limit switch converts mechanical position or motion into an electrical signal without physical contact between part and switch. Parts must be of ferrous material.

Available with either relay output or tube output (which eliminates all moving parts), switch may be used in standard 110v control circuits. Relay panel has output capacity of 5 amp. Transducer or sensing head is magnetic in nature, and is not affected by vibration or the presence of non-magnetic foreign material on its surface. Sensitivity of switch is such that large parts can be sensed at distances up to 1½ in. from transducer head.

Square D Co, 4041 N Richards St, Milwaukee, Wis



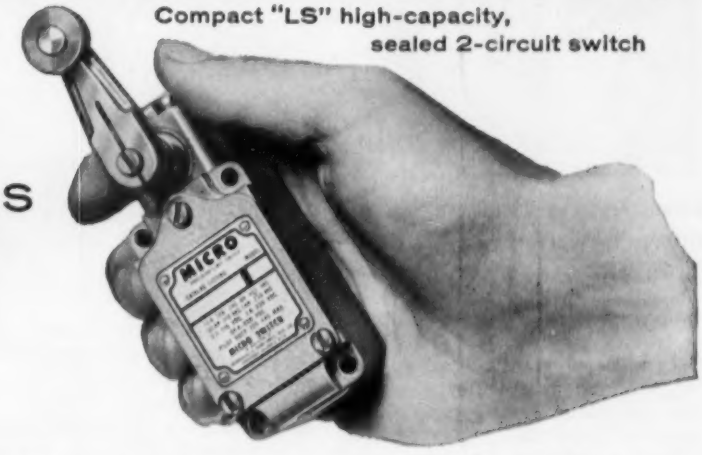
HEAT-EXCHANGER TUBE HOLES are drilled in SAE 1020 boiler plate by special 20-spindle drillhead, which is largely composed of standard components. Machine will handle tube sheets from 8 in. in dia and 1¼ in. thick to 54 in. in dia and 2 in. thick. Company's Hydro 20 column assembly is mounted on special base; 60-in. hydraulic index table permits 57-position spacing. Production time varies from 3 per hr for 8-in. size to 3 per day for 54-in. size—*Michigan Drill Head Co, PO Box 4643, Detroit 34, Mich*

MICRO precision switches

...THEIR USE IS A PRINCIPLE OF GOOD DESIGN

HONEYWELL

THIS SWITCH IS PAYING PLANT OPERATORS BIG DIVIDENDS IN INCREASED PRODUCTION



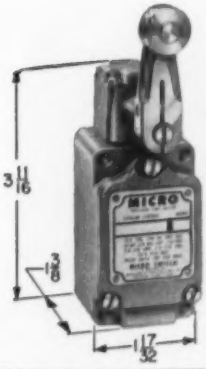
Compact "LS" high-capacity, sealed 2-circuit switch

The MICRO SWITCH "LS" limit switch fills the need for a small, rugged, reliable, two-circuit precision switch to meet the widest possible switch requirements.

All moving parts and the switching chamber are completely sealed, protected from wear or becoming fouled. Field adjustability permits its use in practically any type of application or location.

Two-circuit contact arrangement allows flexibility in circuit design. Reliability of the precision, snap-action unit assures accurate repeat operations throughout many millions of hard, fast actuations. Small and compact in size, this switch is a precision device—yet it is designed and built to stand the most severe abuse.

Like many other precision switches in the MICRO SWITCH line, this versatile switch is ideal for installation on present plant equipment as a limit, interlock or safety switch. So used, MICRO SWITCH precision switches make machinery more automatic, more productive and safer in operation.

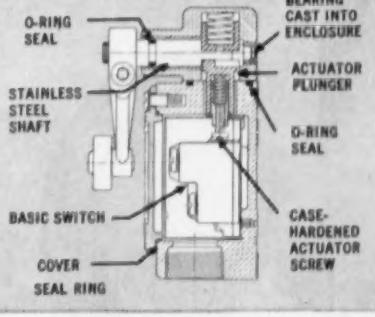


FIELD ADJUSTABLE ACTUATOR

The roller arm actuator is field adjustable through 360 degrees, positively locking in any position. Actuators are assembled to operate in either direction. They can also be converted to operate in one direction only, clockwise or counterclockwise.

SEALS PROVIDE MAXIMUM PROTECTION

Sealing is provided by use of O-ring seals on the actuator shaft and between the actuator head and the housing. A synthetic rubber ring seal is provided for the cover. These seals protect against entrance of dust, oil and other liquids. The switch meets NEMA specifications for an oil-tight pilot device.



TWO-CIRCUIT, DOUBLE-BREAK CONTACT ARRANGEMENT

The electrical rating is: 10 amperes 120, 250 or 460 volts a-c; ½ H.P. 125 volts a-c; 1 H.P. 230 volts a-c; .8 ampere 125 volts d-c; .4 ampere 250 volts d-c; .1 ampere 550 volts d-c. Pilot duty rating is 600 volts a-c max.

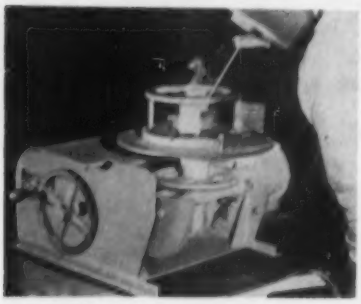
Send for Catalog 83
"Industrial Enclosed Switches"

MICRO SWITCH precision switches are sold in key cities everywhere. Look for the distributor nearest you. See "Switches, Electric" in the Yellow Pages.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

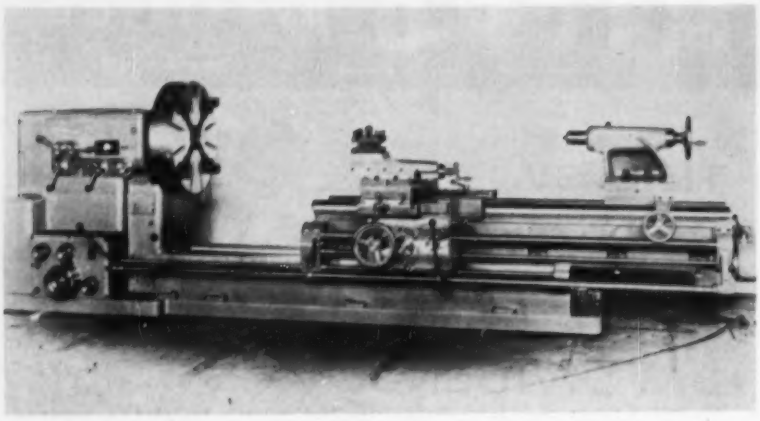


Bench Welding Positioner Offered by Worthington

Model 1P power-operated welding positioner is designed for accommodating small work. Variable-speed drive and worm-and-segment hand tilt facilitate welding, hard surfacing, assembling, grinding, and similar operations. Disengaging clutch provides free wheeling when desired.

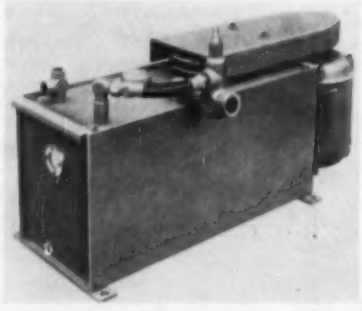
Work is clamped to 16-in. circular top through four 9/16-in. radial slots. Table is rotated by ½-hp motor, tilts through 135° with worm gear. Load capacity is 100 lb, with center of gravity 3 in. from table top and 3-in. eccentricity. Bulletin R-1700-S14.

Worthington Corp, Positioning Equipment Div, Plainfield, NJ



ITALIAN-MADE LATHE, Imperial Model PS-34-61, features instantaneous direct-reading selector for quick-change gearbox. Design is heavy and rigid; base is solid to floor over entire length. Conversion to metric thread chasing, or vice versa, is immediately obtained without transposing gears. 174 different standard threads are obtainable. Spindle speeds with all-geared transmissions are offered over a wide range—*Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, NY*

DIAL INDICATOR GAGES for measuring critical dimensions of railroad axles and wheel bores come in two types: 264 P-400 Series of snap gages measure wheel-seat diameter of axles; each gage is adjustable to measure two sizes of axles. Models B4F P-3 and P-4 vertical-type hole gages measure bores of wheels that fit on axles; each gage has four contact points — two gaging and two centralizing—*Federal Products Corp, 1144 Eddy St, Providence, RI*



HYDRAULIC POWER UNIT, Model DY-10, is assembled by customer. Completed unit will deliver up to 12 gpm and up to 1000 psi of hydraulic pressure. Unit is designed for easy assembly, has a 2-hp electric motor, gear-type pump, relief valve, and a 10-gal reservoir. Complete assembly instructions are supplied—*Rosaen Co, 1756 E Nine Mile Rd, Hazel Park, Mich*

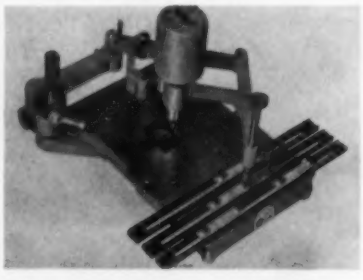
Campco Plastic Materials Offered in Sheet Form

Linear plastic sheet, previously available only in calendered film, is offered in two types:

Extruded polyethylene sheet is said to have excellent resistance to heat distortion, greatly improved rigidity and impact resistance, and high inertness. Sheet can be vacuum-formed into complex shapes and deep draws.

Extruded copolymer styrene sheet, Campco S-1029, has improved strength and color, is available in sizes up to 3/16 in. thick. Material reportedly has high impact strength, even at —40F. It also has high tensile and flexural strength, and a relatively high heat-distortion point. Chemical resistance to acids and alkalies is exceptional.

Campco Div, Chicago Molded Products Corp, 2717 N Normandy Ave, Chicago 35, Ill



Lightweight Engraving Machine For Use on All Materials

Scripta (French) Model SD, weighing 30 lb, combines a fixed ratio pantograph with a series of grooved stencil alphabets. By following the grooves with the tracing stylus, engraving may be done as rapidly as hand-lettering.

System of clamps holds stencils and work in rigid relationship; high-speed cutter on pantograph does engraving. Unit can process all materials from plastics to hardest steel, takes pieces up to 12 in. high.

Imported by W A Wolf Machinery Co, 2910 Santa Fe Ave, Los Angeles 58, Calif

Use V-R Quality Carbides

Get the Facts Today . . .

• **Standards.** Vascoloy-Ramet manufactures and stocks a complete line of standard cemented carbide blanks for solid and tipped cutting tools . . . wear parts . . . punches . . . dies . . . gages . . . bushings . . . guides . . . mandrels . . . lathe centers . . . chisels . . . router bits . . . end mills . . . and hundreds of other items.

Specials. V-R produces custom made carbide blanks for flat and circular form tools and all special cutting tools and wear parts.

Grades. V-R standard grades of cemented carbides will fit most applications.

Quality. V-R advanced manufacturing and control procedures assure you of consistent uniformity of product.

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SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

804 Market Street, Waukegan, Illinois

Since 1930
Leader in the Manufacture
of Quality-Controlled Carbides

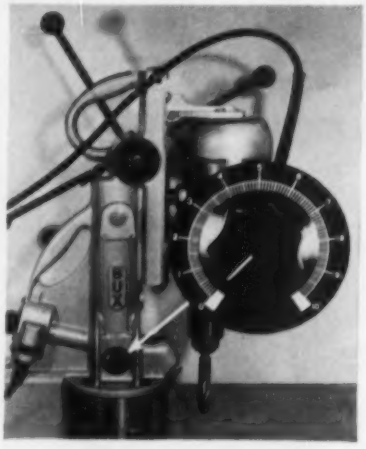
Red Ring Gaging and Sorting Unit Also Controls Gear Machines

Model GRD automatic gear gaging, sorting, and machine-tool control unit has a compact basic design with standardized components which can be adapted to the checking of individual spur or helical gears up to 3-in. diameter and 3 in. wide. Machine can be had in types that will check and sort for both size and helix-angle accuracy or size or helix angle only. It will shut down gear production machine tools automatically after a specified amount of rejects of a specific type are gaged. Indicator lights tell the type of reject that caused the machine shutdown.

Complete machine consists of a motorized gaging and sorting unit through which gears are fed from an inclined feed chute, stand that supports gaging unit and reject pans, separate electrical panel, and control box with pushbutton and indicator light.

In operation, parts are passed between a set of master gears for check on size or helix angle or both. Gears that meet requirements pass on through gage and are deposited on factory conveyor line. Rejects are sorted and deposited in pans under the unit.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich

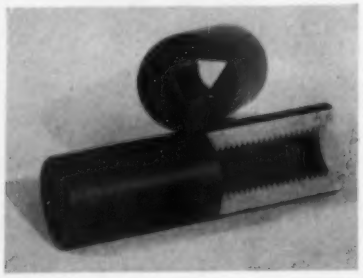


Portable Magnetic Drillpress Has Variable Power Control

Bux electro-magnetic Model V-3 incorporates a rheostat control switch that permits operator to select amount of magnetic pull needed for both holding the drill while positioning and aligning, and for securely gripping it to work while drilling, tapping, or reaming.

Additional features are a new pilot light assembly that floods drill point area with light, and a new, more compact rectifier unit for converting ac to dc.

Buck Mfg Co, 100 Roberts Rd, Los Gatos, Calif



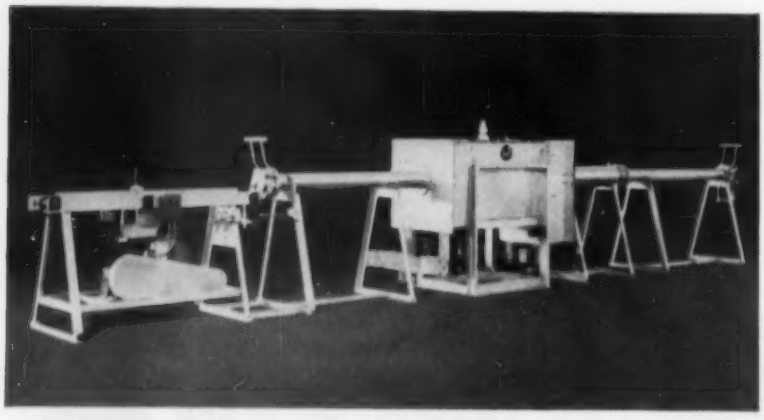
BORING-BAR ADAPTORS, Sizes TB 8 and TB 12, accommodate ¼- and ⅜-in. carbide triangular inserts. Devices are pressed, sweated, or brazed in drilled or reamed holes. Triangular blades of high-speed steel, super high-speed steel, and carbide (tipped) are also available—*Weddels Tools, Inc, 37 Centennial St, Rochester 11, NY*

Boice-Crane Sander-Grinder Has Small Spindle Diameter

Utilizing work-spindle diameters under ¾ in., oscillating-spindle sander and grinder can finish-machine small-radius contours which larger-spindle machines are unable to handle. Spindles with diameters of ¼, ⅜, ½, and ¾ in. are offered.

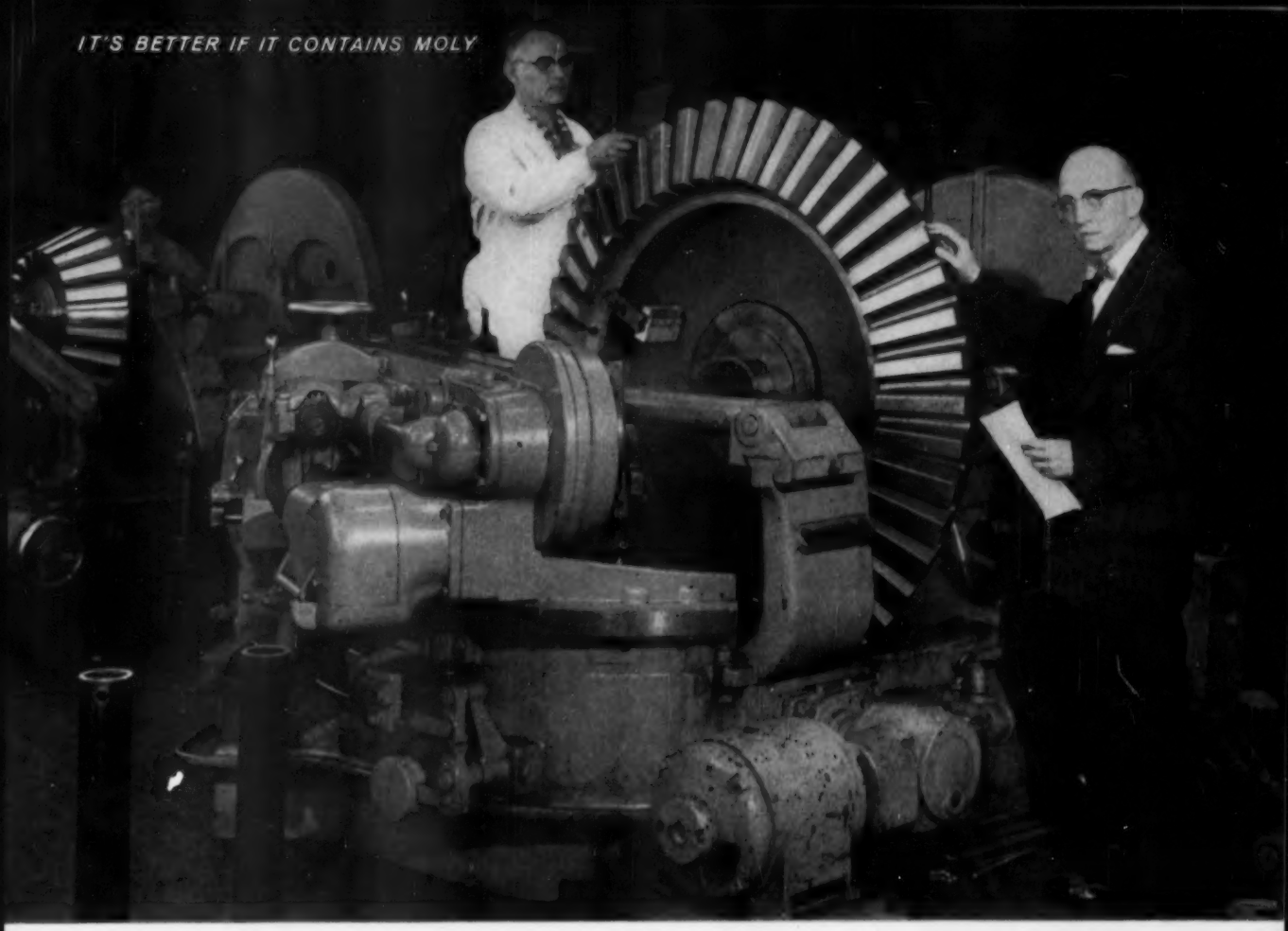
Arbors or drums carrying the abrasive sleeves have tapered shanks which install instantly into a taper-socket main spindle. Drums for abrasives over ¾-in. diameter may remain permanently on the spindles. Complete arbor, drum, and abrasive assembly installs or interchanges with another size in a few seconds.

Boice-Crane Co, 935 Central Ave, Toledo 6, Ohio



CARBON-TUBE FURNACES with tube sizes up to 6-in. ID represent an expansion of company's line to include larger sizes. Furnace permits uniform heating of work within a graphite tubular resistance element in which temperatures up to 5000 F can be indefinitely maintained. Units feature continuous operation, with automatic mechanical pusher, entrance preheating chamber, and watercooled cooling chamber. Purge chambers may be added to maintain low dew-point reducing atmospheres. Largest unit is 28 ft long—*Harper Electric Furnace Corp, 39 River St, Buffalo 2, NY*

IT'S BETTER IF IT CONTAINS MOLY



E. B. Smiley, Metallurgist for Illinois Gear & Machine Co., looks over setup of large, heavy duty bevel gear made from molybdenum alloy steel casting. This gear has been rough turned, rough cut and heat treated to 269 to 302 Brinell before finish cutting.

For Strength, Hardness and Machinability gear maker recommends Molybdenum Alloy Steels

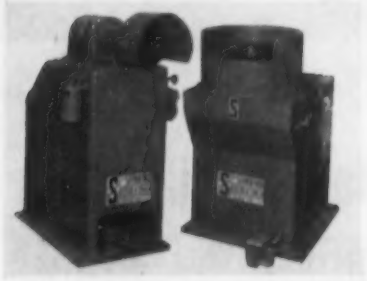
"All of our gears are made to customer specifications, and in many cases these include the use of molybdenum steels," says Mr. Smiley, metallurgist for Illinois Gear & Machine Co. "When our customers specify heat-treated gears of plain carbon steel," Mr. Smiley continues, "we often recommend that they change to 4140 alloy containing molybdenum to achieve high strength and hardenability with good machinability."

Moly steels offer gear users many advantages over carbon steel. Their greater strength and toughness permit the use of smaller weight-saving gears to transmit a given amount of power. Reduced weight and size of gear housings and other components add to the economy of moly steels. And their higher endurance is an important safety factor.

The properties of moly steels are discussed in a new booklet "Moly Steels for Cast Gears". Full technical assistance is also yours for the asking. Write Climax Molybdenum Co., Dept. 12, New York 36, N. Y.

CLIMAX MOLYBDENUM

AUTOMOBILE BUMPER GUARDS in fifteen models are produced on special resistance welder, which produces 300 assemblies per hr, with changeover time for various models only 1 hr. Four-head projection welder performs two pairs of welds in rapid sequence: each operation welds one of the two mounting plates normally joined to the bumper guard shell. Sequence firing minimizes electrical power demand, but it is possible to perform both welds simultaneously—*Taylor-Winfield Corp, Warren, Ohio*

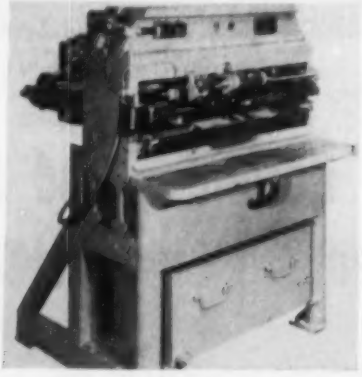


Speed Lathes Offered in Horizontal and Vertical Models

Type CP (vertical) and Type CSL (horizontal) speed chucking lathes can be supplied with single, multiple, and variable-speed motors. They can also be supplied with electric brake motors for stopping and starting the machines a number of times every minute.

Special spindle adapters can be furnished to suit customer's needs. Various makes of hand or air chucks can be arranged for. If air chuck is used, standard equipment includes a footpedal which simultaneously operates air chuck and motor in proper sequence. Spindle speeds can be furnished to suit the application, which can include such operations as deburring, polishing, and blending.

Standard Electrical Tool Co, 2488 River Rd, Cincinnati 4, Ohio



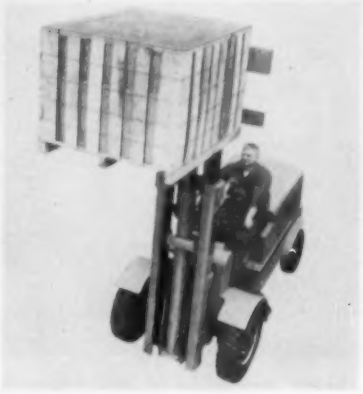
SHAFT-KNURLING MACHINE is intended for use in installing the spline-type knurl on small electric-motor shafts. Model will produce a knurl up to 3 in. long on shafts up to 20 in. long and up to ⅝-in. diameter. Shafts are hand fed down a magazine and automatically roll out into a receiver tray after being knurled. Rate of production is about 3000 per hr—*Morley Machinery Corp, 1239 University Ave, Rochester 7, NY*

Regent Duplicator Table Offered in Improved Model

An adjustable friction brake which allows operator to select the sensitivity desired for each operation has been added to the Regent duplicator table. A second improvement is the incorporation of circular ball-bearing raceways on both longitudinal and cross-travel slides, making for smoother movement.

These improvements enable user to do the most intricate three-dimensional milling on such products as punches, dies, and plastic molds of all types. Table is also available with overarm to fit the Bridgeport-ram-type machine, as well as the round overarm-type machine in company's line.

Regent Machine Co, Bridgeport, Conn



Power Steering Standard On Truck-Man Fork-Lift Truck

Model Y-60 fork-truck features a 6000-lb lift with power steering as standard equipment. Powered by a 226-hp, 20-mph Continental engine, truck has heavy-duty tires, oversize clutch, double-acting hydraulic brakes, welded all-steel frame, and heavy-duty transmission.

Telescoping mast has 9-in. free lift with 10° forward tilt and 4° back tilt.

Truck-Man Div, Knickerbocker Co, 537 Liberty St, Jackson, Mich

Indicating light permits operator to check whether an unlit indicator lamp is an indication of trouble or merely the result of a lamp failure. By pressing lens of the light, operator transfers lamp from its normal circuit to a separate built-in lamp test circuit. If lamp is functioning, it will light normally to indicate that trouble-shooting is in order. Light is of transformer type, is available for applications of 110, 220, and 440 v.

Westinghouse Electric Corp, Standard Control Div, Beaver, Penna

Grinding costs roaring skyward? We can engineer savings for you

Most grinding costs are on the rise. Are your "routine" jobs still operating at what *was* peak efficiency? Call Peninsular's skilled abrasive engineers to survey your entire operation. Their analysis can increase efficiency, prolong wheel life . . . keep costs from skyrocketing.

For example, on this portable grinding operation, Peninsular grinding wheels cut faster and smoother. Hourly production increased, while operator fatigue was reduced. And the longer life built into Peninsular grinding wheels paid dividends by removing more metal per pound of abrasive.

Call, write, or wire us today!

Resinoid and Vitrified Grinding Wheels

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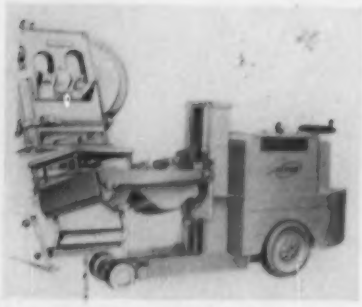
GRINDING PENINSULAR WHEELS

PENINSULAR GRINDING WHEEL DIVISION—ABRASIVE AND METAL PRODUCTS COMPANY—DETROIT, MICHIGAN



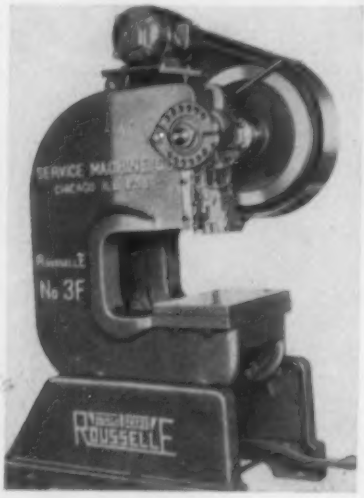
Elwell-Parker Die-Handler Accommodates Inclined Presses

Die-handling truck with capacity of 5000 lb is designed for handling dies onto medium or large inclined presses. Special die handler is built on the chassis of an electric-powered high-lift platform truck which is equipped with a rotating, tilting platform 44 in. long and 50 in. wide. When rear of platform is tilted up to match the angle of the press bed, dies can be pulled onto the platform over the end of the truck.

If side loading is required, truck can be positioned alongside press and the platform rotated to right or left to match the angle of the press bed. Both tilt and rotate functions are actuated by hydraulic cylinders. Hydraulic lift cylinder raises or lowers platform.

Truck can also be used for die handling in and out of standard horizontal presses.

Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio



New Rousselle OBI Press Has Extra Throat Depth

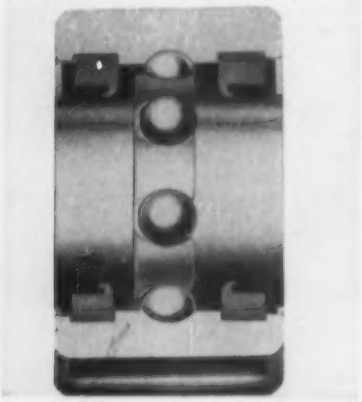
Model 3F Rousselle 25-ton press has 15-in. throat clearance, operates at 120 strokes per minute.

Rugged semi-steel frame is heavily reinforced. Additional features include a roller bearing flywheel; extra heavy clutch which can be set for single stroke or continuous operation; bearings that are closely mounted to eliminate shaft deflection; full-length V-type ram guides precision ground to maintain true alignment. Area of bed is 14 x 20 in.; standard stroke is 2 in.

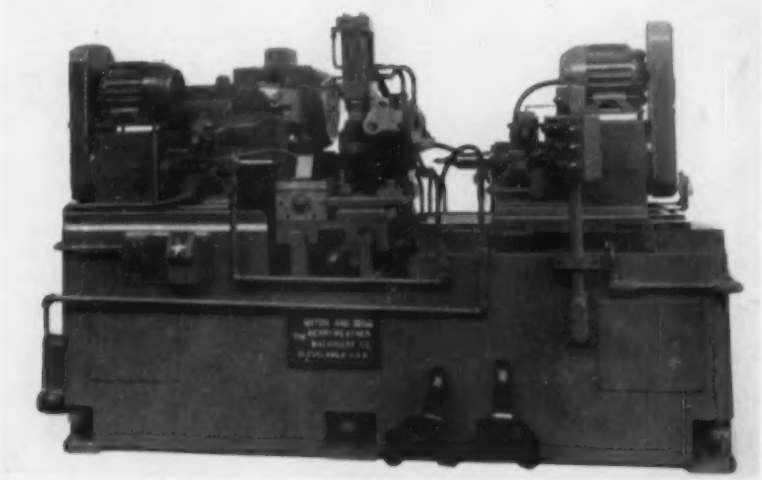
Rousselle Model 2F, a 15-ton unit operating at 180 strokes per min., is also available.

Service Machine Co, 2310 W 78th St, Chicago 20, Ill.

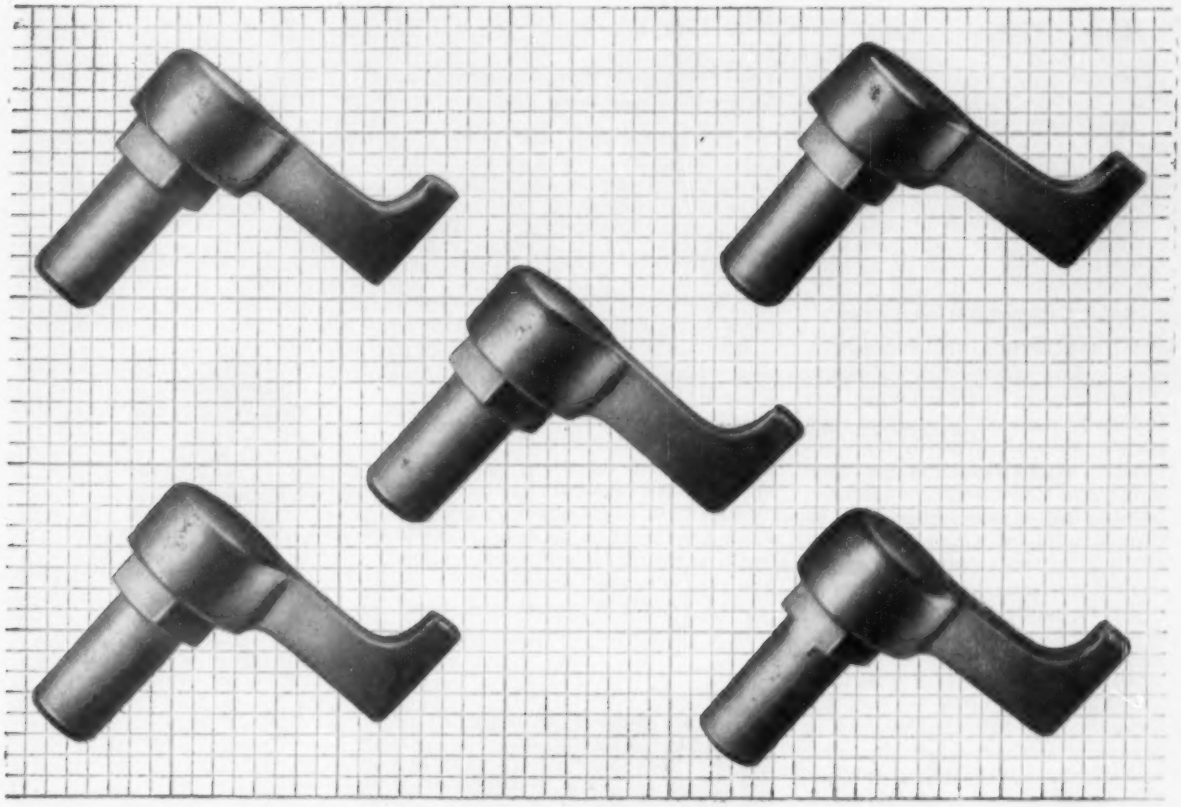
POINT INDICATOR, designated Miracle, is a combination angle-finding, center-locating, and leveling device, consisting of a mercury-balanced level and degree-calibrated dial enclosed and mounted on a magnetized V-base. When base is placed against a surface, instrument will read off the exact angle at which work is being held, accurate to within 3 min of a degree. Center punch runs through device to aid in marking hole locations. Price is $25—*Racine Instrument Co, 500 College Ave, Racine, Wis*



CONVEYOR ROLL BEARINGS designed for use in belt-conveyor rolls are offered in both inboard and outboard mounting types, utilizing various types of seals in synthetic rubber and cork-felt combinations to hold grease in and keep dirt out—*Marlin-Rockwell Corp, Jamestown, NY*



TRUCK STEERING KNUCKLES are handled on universal milling and centering machine at rate of 90 to 120 per hr. Part has a shank end that must be milled to length and centered with the opposite end centered on the flange between protruding bosses. Cycle is automatic, including unclamping when completed. Center-drilling unit has hydraulic quill feed, milling head is single-speed production unit—*Motch & Merryweather Machinery Co, 888 E 70th St, Cleveland 3, Ohio*



Cam Segment—weighs less than an ounce, measures less than ½ inch.

Investment-Casting improves part ... eliminates hours of machining

HAYNES' investment-casting process made it possible to mass-produce a small intricately-shaped part in a hard, abrasion-resistant alloy. The part, a cam segment, is less than one-half inch long, and weighs only a fraction of an ounce. It is cast to size. Only one simple threading operation is required to prepare it for operation.

The cam segment is used in a control instrument and rides against a valve shaft under pressures up to 35 lb. per sq. inch. At one time it was cast from a relatively soft metal and machined to final dimensions. The machining time for each cam was several hours—an expensive operation. The performance of the part was unsatisfactory because the metal used was selected for ease of machining—and could not stand up under the abrasive conditions.

The investment-cast segments are now made of type 410 stainless steel. They have been used for over one million operations and still show no signs of wear.

The freedom to select alloys for performance, regardless of how difficult they may be to machine, is one of the big advantages of HAYNES' investment-casting method. Intricate shapes in hard metals can be cast close to size, eliminating many machining operations. For full details on the process, write to our general sales office in Kokomo, Indiana, or any of the district sales offices listed below.

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

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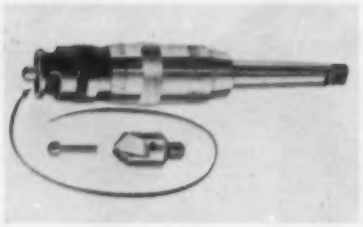
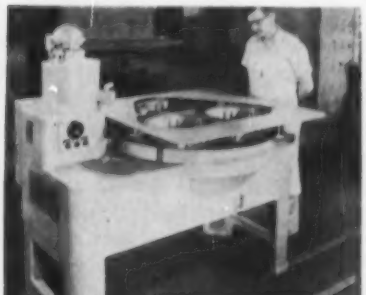


Cogsdill Countersink Drives Have Pre-Travel, Over-Travel Features

No. 340 and 440 Micro-Limit drives for chamfering, countersinking, and counterboring tools differ from company's previous drives in the combination of pre-travel and over-travel features added. Depth of chamfer, countersink, or counterbore can be pre-set in increments of 0.001 in. by rotating the lower part of the depth-control sleeve by hand.

Sleeve, under spring tension, allows ¼-in. pre-travel before tool engages part. When pre-set depth is reached, an over-travel of from ¼ in. (on 340 drive) to ⅜ in. (on 440 drive) is provided. Combination of pre-travel and over-travel allows for considerable variation in part thickness, positioning, and spindle travel without affecting accuracy of the work done. Thrust load is taken on ball bearings through a hardened-steel stop collar rotating on needle bearings. 54 included-angle and pilot-size combinations are available for each drive.

Cogsdill Twist Drill Co, Oak Park, Detroit 37, Mich



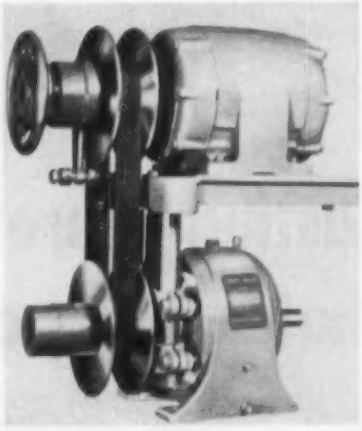
LAPPING MACHINE, addition to Lapmaster line, has 36-in. lap-plate diameter. Inside diameter of the conditioning rings is 14½ in., thus permitting handling parts up to that size. Fork-style agitator is placed at a 30° angle in the agitator tank to facilitate mixing of abrasive when left loaded in tank overnight. Machine reportedly can generate surface flatness to less than one light band and finishes to 2 rms—*Crane Packing Co, Dept AMN, 6400 Oakton St, Morton Grove, Ill*

DoAll Establishes New Standards For Its Precision Gage Blocks

DoAll is producing a new grade of gage blocks, designated AAA, accurate to plus or minus one millionth of an inch (0.000001) per inch of length. They are available in square or rectangular blocks in sets of 86 pieces.

Additional improvements: optical finish on gage blocks guaranteed to be 0.09 mu-in. rms or better; A grade blocks for the price of B grade; AA grade at the price of former A grade; B grade discontinued as inadequate for today's dimensional requirements; A grade tolerances tightened to + 0.000004 –0.000002 per in. (exceeding NBS requirements); actual block size certified to nearest millionth is furnished with every gage block in calibration report.

DoAll Co, 254 N Laurel Ave, Des Plaines, Ill



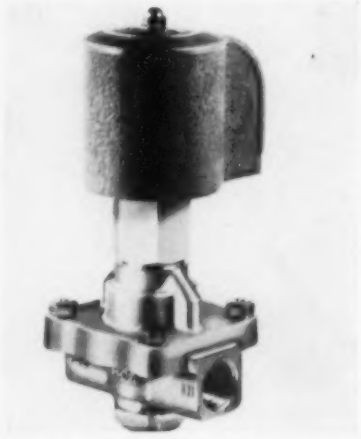
VARIABLE-SPEED DRIVE, called Vari-Mount, is offered in a line which features standard, interchangeable components and which accommodates standard motors. Capacities range from 1 to 15 hp, with max speeds of 711 to 15.1 rpm and min speeds from 355 to 2.5 rpm. Drive is available in vertical or horizontal models and can be operated by remote or manual control—*Foote Bros Gear & Machine Corp, 4545 S Western Blvd, Chicago 9, Ill*

Magnetostriction Transducer

High-power transducer has been designed for large-scale ultrasonic cleaning, degreasing, descaling, plating, and other metalworking and finishing operations.

The 400-w 25-kc units can be mounted externally on existing process equipment and driven in tandem by electronic or rotary-driven above-audible frequency generators ranging in power from 2000 to 150,000 w. Transducers reportedly can be used with liquids at temperatures far above boil point, thus overcoming limitations present in barium titanate types.

Acoustica Associates, Inc, Glenwood Landing, LI, NY



PILOT-OPERATED SOLENOID VALVE of high-pressure type has bronze body with ¾-in. port and pressure range of 15 to 300 psi. Two-way unit will handle heavy fuels up to 200 F. Designated HV 44-816, valve closes when solenoid is de-energized, opens when solenoid is energized — ***Automatic Switch Co, 391 Lakeside Ave, Orange, NJ***

Paste-type flux for high-temperature brazing of stainless and other high-alloy steel is called Nicrobraz. Material cleans and promotes wetting of surfaces to be joined, helps dissolve oxides during the brazing action. Paste does not separate or crystalize; where thinner consistency is required, it may be diluted with water. Melting point is below 1200 F. It is recommended for applications involving temperatures between 1600 and 2200 F.

Wall Colmonoy Corp, 19345 John R St, Detroit 3, Mich

Reclaiming of threading dies is accomplished by mechanical process which reportedly is accomplished without change of temper or distortion of die. Company reports that cost of reconditioning old die is only a fraction of cost of new die.

Die Reclaiming Co, 731 Springfield Ave, Irvington 11, NJ

13" TOOLROOM LATHE

SOUTH BEND 13" LATHES

Illustrated — 13" x 5' bed Toolroom Lathe, less motor and controls, f.o.b. factory. **$2049**

for accurate, low-cost machining

South Bend 13" Lathes are popular where there is a variety of precision parts to be machined. Costs drop as their accuracy and efficiency keep production flowing fast even on the "headache" jobs. Operators prefer them for their simplicity and practically effortless handling. Also, set-ups and change-overs are made so quickly and easily that down-time is held to a minimum.

Now is the time to find out how these quality-built lathes can also bring you better machining at lower costs. Let your near-by South Bend distributor show you how they can ease your production, toolroom and maintenance machining problems. Or, mail coupon for literature on the 13" Toolroom and Engine Lathes.

SPECIFICATIONS

Swing—13⅛" over bed and saddle wings, 8" over saddle cross slide.

Distance Between Centers—28", 40" and 52".

Collet Capacity—1" maximum (collets interchangeable with 10"-1", 14½", 16" and 16-24" South Bend lathes).

Spindle Bore—1⅜".

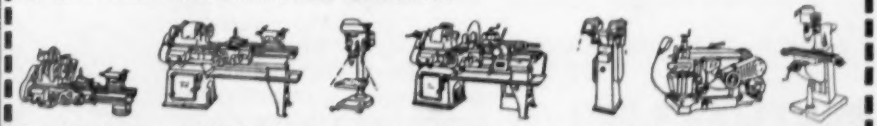
Spindle Speeds—Six to Sixteen 40 to 940 r.p.m. or 20 to 940 r.p.m. approximately.

Longitudinal Feeds—48 R.H. or L.H., .0015" to .0841".

Cross-Feeds—48, .0006" to .0315".

Thread Cutting—48 R.H. or L.H. pitches, 4 to 224 per inch.

PLEASE SEND INFORMATION CHECKED:



☐ 9" and 10" BENCH LATHES ☐ 10" to 16-24" FLOOR LATHES ☐ DRILL PRESSES ☐ ½" & 1" Collet TURRET LATHES ☐ TOOL GRINDERS ☐ 7" BENCH SHAPERS ☐ MILLING MACHINES

Name_____ Street_____

City_____ State_____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • *South Bend 22, Indiana*

15-in. Diameter Rotary Table Has Accuracy to Within 30 sec

Advance 15 is designed for all types of close tolerance work requiring rotational accuracy to within 30 sec. The 15-in.-dia working surface has four T-slots.

All parts operate in oil bath. Features include Timken precision tapered roller center bearing; one-piece worm and wormshaft; disengagement lever providing instant worm throw-in or throw-out; rotation stop block and rotational stops that may be clamped on any point on periphery; double worm lock levers to prevent any movement or deflection even under extreme loads.

Morrison Engineering Co, 941 W Lake St, Chicago 7, Ill

Pencil-Type Soldering Tool

Small, lightweight tool is especially suitable for rapid production soldering and repair or corrective work on printed circuit panels. Tapering plastic handle of phenolic molding compound is cool to the touch, has an auxiliary cork sleeve.

Models will be supplied in 30-w size at standard voltages; standard tip size, ¼-in.-dia.

Vulcan Electric Co, Danvers, Mass

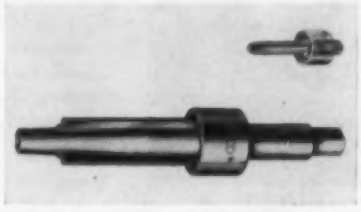
Heavy-Duty Platform Trucks Carry up to 20,000 lb

Hydroelectric line of heavy-duty platform trucks has been expanded to include capacities up to 20,000 lb. Hand-motorized units up to and including 14,000-lb capacity use company's Dyna Dual enclosed drive; 16-to-20,000-lb trucks use twin dual drives.

Platform widths of 27-in. minimum are offered, in lengths of 48 in. and up; lowered heights of 9, 10, and 11 in. are available. 3½ in. of lift is provided by either dual or quad lift cylinders activated by heavy-duty pumpmotor unit. Bulletin KW-156.

Lift Trucks, Inc, Cincinnati 14, Ohio

WET-BLASTING UNIT, of pressure-blast type, is a manually operated machine converted for use in automatic operations. Standard 30 x 30-in. cabinet is fitted with air-draulic cylinder for the motivation of a blast-gun cluster through a horizontal path. Small gearmotor rotates workholding chuck within cabinet. Loading door is substituted for armports at front of cabinet on manual model—*Cro-Plate Co, Inc, 747 Windsor St, Hartford 1, Conn*

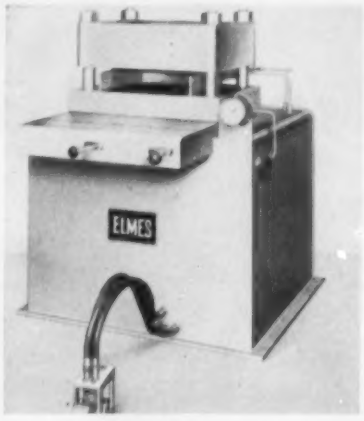


Le Count Expanding Mandrels Have Straight Jaws

Line of expanding mandrels called Count-Centric has straight jaws which provide an extra-long bearing surface over a wide bore range. Permanent jaws maintain tolerances to 0.0005-in. TIR for Type B and 0.0002-in. TIR for Type SB. Fourteen tools provide for every bore size from ⅜ to 3¼ in.

Miniature duplicate of the above is Type M and SM Micro-Mate expanding mandrel. This smaller version is designed for work with precision instruments which perform miniature operations. Six standard tools cover range from ¼ to ⅜ in.

Le Count Tool Works, Inc, 390 Capitol Ave, Hartford, Conn



SPECIAL HYDRAULIC PRESS is basically a standard Hydrolair unit which uses shop air line for power. Pumpless and motorless unit has a moving-down platen, being designed for an assembly operation wherein manual controls operate the pressing platen and a foot-switch is installed for actuating an unloading mechanism. Press has 50-ton pressure capacity, uses air pressures of 80 to 90 psi—*Elmes Engineering Div, American Steel Foundries, 1150-A Tennessee Ave, Cincinnati 29, Ohio*

Heat-resistant paint known as Heat-Rem QD Black is intended for use on surfaces subjected to temperatures up to 600 F. Paint air dries to a tough, bright finish in less than two hours, reportedly resists extreme temperature variations, smoke, moisture, fumes, mild acids and alkalis. Applied by brush or spray, it is recommended for protecting steam lines, vats, heat lines, ovens, and tanks. Bulletin 4261.

Speco, Inc, 7508 Associate Ave, Cleveland 9, Ohio

Power steering in improved form is available on all models of 6000-lb capacity and over in Towmotor line of fork-lift trucks. No special equipment is required to make the change from manual to power steering. System uses hydraulic oil and operates at maximum pressure of 1000 psi. Folder describing steering is offered.

Towmotor Corp, 1226 E 152nd St, Cleveland 10, Ohio

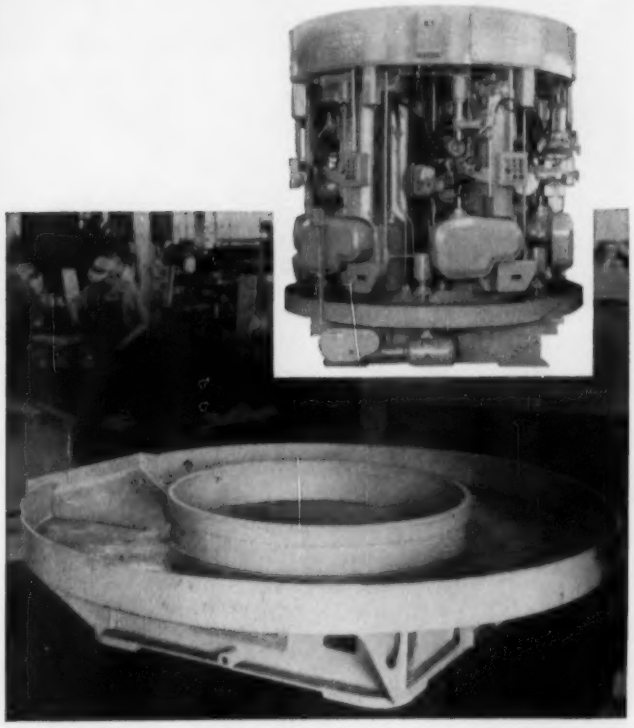
When a product design can be simplified...

Has greater strength... higher rigidity...

Yet takes less material... costs less to produce...

WHY use anything but welded steel

All welded base *for multiple spindle hobbing machine. Photos courtesy The Lees Bradner Company, Cleveland, O.*



Cost of manufacture cut 10%
by changing to welded construction

Formerly a casting, this machine tool base has changed over to welded steel construction, accomplishing several important benefits.

These benefits are:

1. **Lower cost** in fabricating and assembling.
2. **Simpler construction,** eliminating costly details like corner posts.
3. **Lower weight.**
4. **Closer alignment** of machine spindles.
5. **More rigid design,** incorporating integral coolant reservoir.

Benefits like these can be applied to many of your designs. Let Lincoln show you how. Write

THE LINCOLN ELECTRIC COMPANY

Dept. 2015 · Cleveland 17, Ohio

Creating Lower Costs for Industry . . .
With Welded Steel

W-T WALKER-TURNER

COMPARE — You'll see that you get a lot more for your money when you buy W-T "Light-Heavyweights"!

Another NEW "Light-Heavyweight"! — cuts bars, rods, tubing . . . and production time!

This newest machine in Walker-Turner's "LIGHT-HEAVYWEIGHT" line makes mighty short work of cutting bars, rods and tubing. The abrasive wheel cuts true and clean — saves time for you with every cut it makes and frequently eliminates finishing operations.

You can tap the cast-iron table to mount any work-holding devices you want. We furnish a template to drill for angle-mounting of the head — or it can be factory-mounted at 45° for miter cutting.

Walker-Turner "Light-Heavyweight" Abrasive Cut-Off Machine: Capacity: 1-1/2" round bar; 3" tubing. Abrasive wheel, 12" dia. x 3/32", on 1" spindle. Speed, 3720 rpm, 11,710 fpm. Heavy guard provides 216° peripheral protection; easily removed for wheel change. 3 hp. 220/440 v. 3-phase motor — fan-cooled, totally enclosed, ball-bearing, overload capacity up to 7 hp.

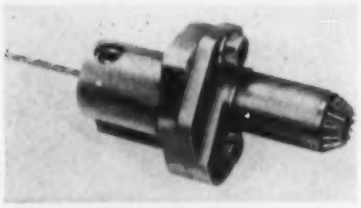
Ask your Walker-Turner Distributor to demonstrate what this new Cut-Off Machine will do for you. He's listed under "Tools" in your phone book's Yellow Pages. Or write for his name and complete specifications.

DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT
RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS
RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS
JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

walker-Turner

WALKER-TURNER
Division
Rockwell Manufacturing Co. · Pittsburgh 8, Pa.

HEAVY-DUTY ELECTRIC TRACTOR has normal draw-bar pull of 600 lb and max draw-bar pull of 1600 lb. Provided with front-wheel steer and rear-wheel drive, tractor has over-all length of 67 in., over-all width of 34 in., and turning radius of 62 in. 3900-lb unit has a top speed of 6.2 mph—*Lewis-Shepard Products, Inc, Dept R-25, Watertown, Mass*
1690



Turret Drilling Attachment Drills Holes On or Off Center

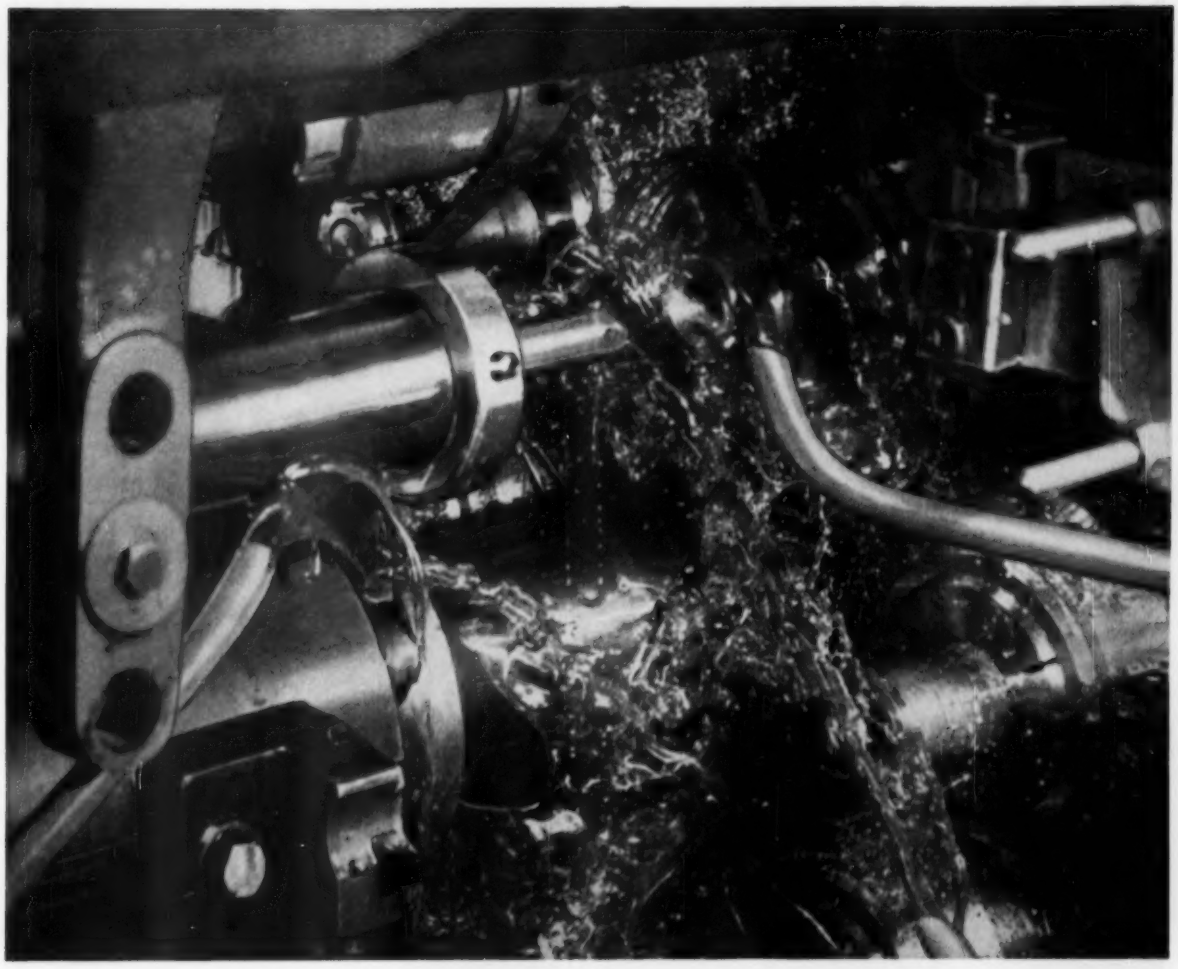
Attachment can be adjusted to drill holes in the end of bars either on or off center within capacity of machine on which it is used.

Tool is available with ⅝, ¾, or 1-in.-dia shank. Spindle assembly runs in a bronze shank and body in which there are two ball bearings. Drive is transmitted to spindle by a shaft through the turret which in turn receives its drive from a pair of bevel gears mounted in turret's center.

R & L Tools, 1825 Bristol St, Philadelphia 40, Penna

Coolant compound, International No. 48, is an amine nitrite-type concentrate which dissolves readily in water to form a stable, transparent solution at all working concentrations. It can be re-used indefinitely, and is said to provide excellent temporary rust protection. Compound is recommended for offhand and plunge grinding as well as for operations involving high stock removal, such as in grinding cast iron.

International Chemical Co, Dept 199, 2628 N Mascher St, Philadelphia 33, Penna



No Staining!

Here's how to prevent staining susceptible metals. Switch to Sinclair WILKUT® Heavy Duty Non-Staining Cutting Oils. These sulphurized-fat type oils are particularly suited to general machining operations where metal staining is to be avoided. You get these extra benefits: easier *heavy duty cutting* on both ferrous and non-ferrous metals, excellent heat dissipation and wetting ability, minimum drag-off, and high stability for long sludge-free operation.

Another important advantage – you can apply Sinclair WILKUT Cutting Oils as a machine tool lubricant to avoid ill effects from cross-leakage of cutting fluid and lubricating oil.

If you have a staining problem, switch to Sinclair WILKUT Cutting Oils. Call your local Sinclair Representative for further information, or write for literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N.Y. *There's no obligation!*

SINCLAIR

WILKUT CUTTING OILS

Making Machines . . . To Make Living Better

In the illustration below a blessed event of real significance is taking place. A machine tool is being born.

This is indeed a blessed event, because everything we eat, use and enjoy comes from raw materials that have been transported and finished with the aid of tools. Once you build a machine you put it to work manufacturing products for lots of people.

Tools make nearly everything we use, even more tools. In fact, machine tools, like humans, can actually reproduce themselves. In the picture a DoALL band machine is being used to create parts for another machine tool. It is slicing out a complete section of solid steel several times faster than the former machining method. The former machine slowly whittled away the unwanted section a chip at a time.

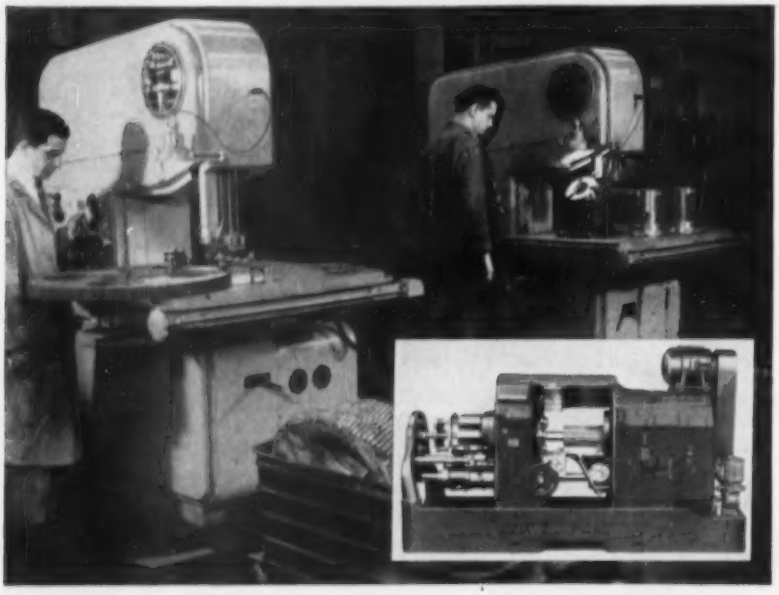
The DoALL is the most recent of the basic machine tools. It represents the newest concept of mass production machining. The cutting tool is a narrow steel band carrying hundreds of cutting edges. It cuts continuously, without wasted back strokes, at velocities up to 10,000 feet per minute. The machine has hydraulic feed, variable speed and a built-in coolant system. No other machine can be so inexpensively fixtured for automatic duplication of work.

The DoALL permits more tools to be built better, faster, and at lower cost. This produces more mechanical servants for the industrial household. Since these servants are the source of most goods, they represent the real wealth of this country—the nation's capital.

Every inducement should be offered to interest industry in investing in such tools. Multiplying population requires corresponding increases in the tool population. Only in that way can more mouths be fed, more bodies be clothed and more people made comfortable.

Excessive taxes that retard the flow of risk capital into new equipment slows the birth rate of new tools. Left unchallenged, such taxes would threaten the amount of available goods and services for our growing population.

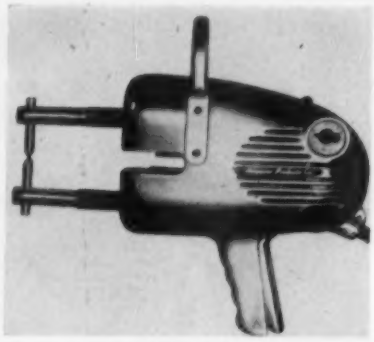
BIRTH OF REAL CAPITAL—a machine tool making parts for another machine tool.



EDUCATIONAL WALL CHARTS. Four new study charts portray the fundamentals of economics showing how man's material welfare is in direct ratio to his use of newer and better tools and how these tools can lead to world peace. Call your local DoALL Store or write . . .

Reprints available for your employees.

The DoALL Company
Des Plaines, Illinois
38 Local Sales-Service Stores E-50



Redesigned Portable Spot Welder Has Electronic Timing Control

Model 55, designed to replace Model 5201, will handle a combined thickness of 3/16-in. cold rolled steel.

Built-in electronic timing control operates a solenoid contactor which is mounted on the end of the power cable complete with Hubbell twist lock male plug. Unit is said to be particularly adaptable for light production runs, maintenance, and repairs.

Larger Model 5403, a production welder with similar features, has completely water-cooled transformer arms and tips.

Ampower Products Co, PO Box 464, Oak Lawn, Ill

Vernier-adjustment attachment can be applied to any roll feed by removing universal joint in feeding mechanism and replacing it with attachment. Plus and minus scale on attachment shows at a glance the adjusting increment and makes possible a readjustment immediately without changing the adjustment on the eccentric of the press. Each line on scale equals 0.008 in. in feeding length.

Durant Tool Supply Co, 136 S Water St, Providence 3, RI

Graphite container with rubber squeeze bulb attached provides several thousand "shots" of lubrication. Areas up to 100 sq in. can be covered by fingertip pressure on rubber bulb. Device costs 65¢.

Servwell Products Co, 6541 Euclid Ave, Cleveland 3, Ohio

Self-locking spline nut developed for use with aluminum and magnesium alloys, Type ND2398, serves as a blind-mounting fastener for spots where it is desirable to have an attached nut for ease of maintenance. Counterbored shank accommodates "AN" thread-length bolts used in

Made with MAGNESIUM

DOW

A FEW POUNDS make a big difference when jigs have to be moved manually several times an hour.

MAGNESIUM FOR LOW-COST TOOLING

Lightweight magnesium tooling plate costs less to buy, less to fabricate and less to use

• COSTS LESS TO BUY—Magnesium tooling plate costs less than commonly used lightweight tooling materials.

• COSTS LESS TO FABRICATE—Magnesium jigs and fixtures are easy and economical to build, too. The reason is that magesium tooling plate is easy to machine, easy to weld.

• COSTS LESS TO USE—Magnesium weighs one fourth as much as steel and only two thirds the weight of aluminum. By making your jigs and fixtures with lightweight magnesium you'll increase worker efficiency and reduce lost-time injuries.

For more information about magnesium tooling plate contact your nearest supplier of Dow magnesium, or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 397BB.

Available from stock at: **Copper and Brass Sales, Inc., Detroit, Mich. • Fullerton Steel and Wire Company, Chicago, Ill. • Hubbell Metals Inc., St. Louis, Mo. • A. R. Purdy Co., Inc., Lyndhurst, N. J. Reliance Magnesium Company, Los Angeles, Calif. • Vinson Steel and Aluminum Co., Dallas, Texas.**

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SAFETY FIRST — POSITIVE LOCK MAINTAINS SELECTED OPENING

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SAFETY FIRST — POSITIVELY NO CHANGE IN ADJUSTMENT UNDER PRESSURE

● You can use a Williams Locking Adjustable with confidence. The sure-grip of its "locked-in" adjustment makes it safer to use.

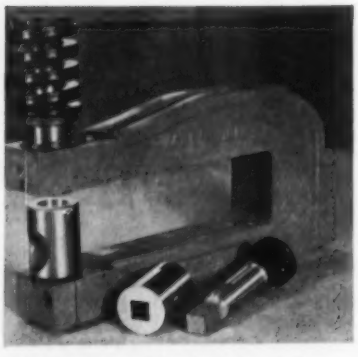
Why accept less when you can get the best . . . at no extra cost. Made in 6, 8, 10 and 12 inch sizes. You'll get prompt service at lowest cost by ordering through your local distributor.

J. H. WILLIAMS & CO. 407 VULCAN STREET BUFFALO 7, N. Y.

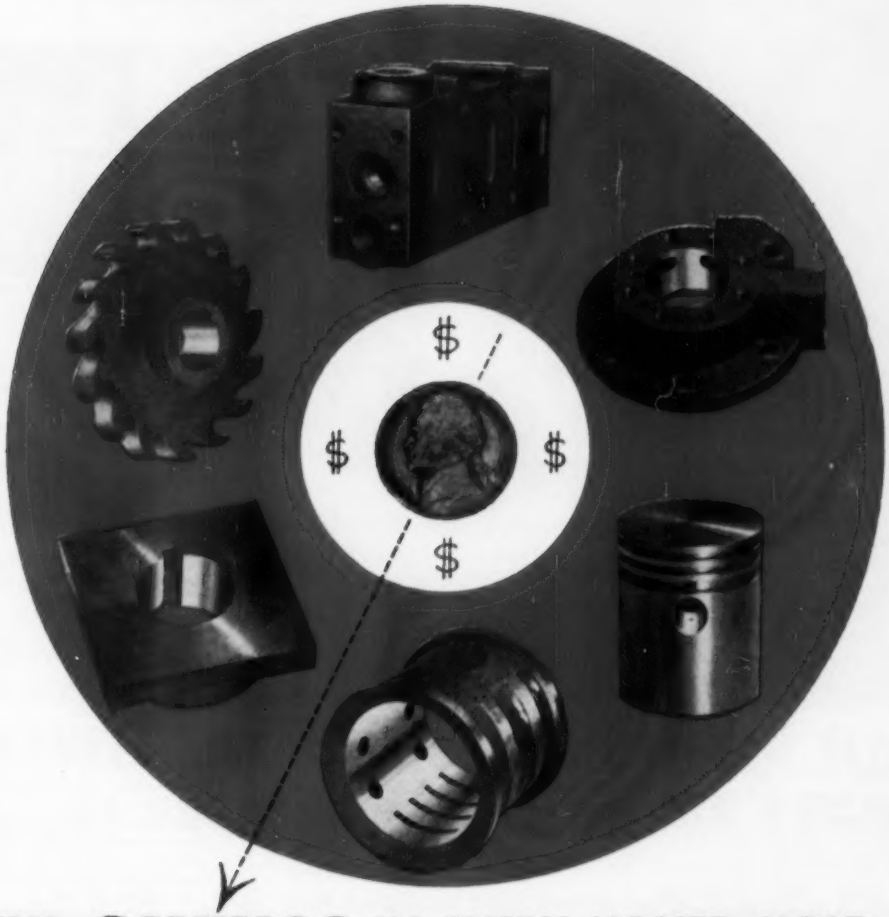
WILLIAMS
INDUSTRIAL TOOLS
"The Broadest Line of Its Kind"

aircraft construction. Red-nylon locking insert is used. Nut is available in cadmium-plated steel in six sizes up to ½-20 thread size.
Elastic Stop Nut Corp of America, Union, NJ

SUPER-STRENGTH STEEL BOLTS designated Hi-Psi are claimed to be 40% stronger than standard aircraft fasteners, and are designed for use in construction of jet aircraft. Structural-steel devices are rated at a minimum tensile strength of 230,000 psi and minimum shear strength of 130,000 psi, and are being produced in diameters ranging from ⅝ to 1½ in. Thread is said to have a 30% larger root radius than conventional fasteners — *Standard Pressed Steel Co, Jenkintown, Penna*



PUNCHING UNIT, Model CJ, has a capacity of 1¼-in.-dia hole in ¼-in.-thick mild steel. Round and shaped punches can be used interchangeably in the unit. Two keyways in the punch and die allow 90° positioning of each shape. Other angles of keying are also available. Units may be located on mounting templets T-slot bed plates, or press-brake rail for multi-punching of flat sheet, angle or extruded parts— *Wales-Strippit Corp, 345 Payne Ave, North Tonawanda, NY*



YOU FIND **SAVINGS** IN EVERY HONED HOLE

One way or another . . . Sunnen Honing will cut your production costs:

1. It eliminates chucking and set up (you often complete the job in less time than required to set up other machines).
2. Interchangeability of honed parts makes assembly of mating units faster, easier.
3. In many cases, honing eliminates grinding, broaching, double reaming and finish boring.
4. Increases production when used **for final sizing** of holes partly completed on automatic machinery . . . eliminates bottlenecks.
5. Does not require expensive skilled labor.
6. Assures longer product life with less maintenance.

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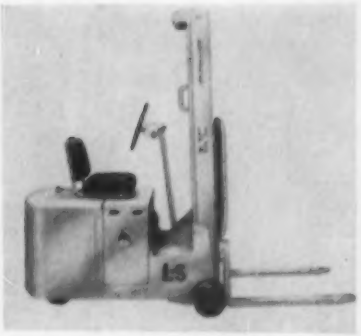


ELECTRIC FORK TRUCK, Model JFTT-2.5 has a capacity of 2500 lb, 48-in. load length, short turning radius of 56¼ in. I-beam mast with standard collapsed heights of 68 and 83 in. gives lift heights of 97 and 127 in. and free lift heights of 49 and 64 in. High-pressure hydraulic system gives lift speeds of 35 fpm empty and 25 fpm loaded—*Lewis-Shepard Products, Inc, Dept R-23, Watertown, Mass*

Fastening device called Spherelock consists of an insert and mating screw, can be supplied in all sizes and standards, including AN, NAS, MS, and SAE. Screw is screwed into countersunk hole, then insert is placed into slot in screw head. Insert is curved piece which is flattened in screw slot by special tool to provide locking action.

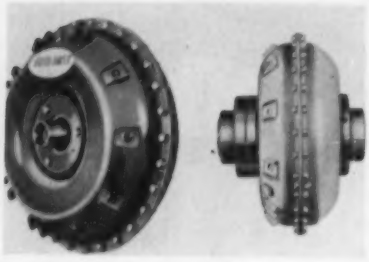
Bellford Metal Products, Inc, 5900 Maurice Ave, Cleveland 27, Ohio

Liquid Neoprene, called Rubber-Coat, can be brushed or sprayed on objects to provide oil resistance, abrasion resistance, low permeability, and resistance to temperature and chemicals. Material is available in black, red, light gray, and aluminum. Maker points out that no primer is needed for most applications. Material dries normally in 30 to 45 min.

Wilbur & Williams Co, 130 Lincoln St, Boston 35, Mass

Variable-pitch motor pulleys called Var-a-Cone are available in various combinations of "fixed-center" drives providing speed variations up to 7½ to 1 ratio. Pulleys in diameters of 3⅝, 4, 5, and 5¾ in. with ratings from 1/3 through 1 hp are used to make up the combinations. Fixed-center drive consists of two units, one mechanically operated and one spring loaded, using either an "A" or "B" section belt. Proper belt tension is maintained, shaft centers are kept fixed, and no adjustable motor base is needed. Driving speeds may be changed without stopping the motor.

Gerbing Mfg Corp, 11800 Milwaukee Ave, Northbrook, Ill



TRACTION-TYPE FLUID DRIVE, Gyrol Size 126 Type T, is designed for industrial use with internal-combustion engines as a fluid-power transmission. Power rating is from 25 to 85 hp, depending on drive speed. Unit is reported well suited to constant-speed electric-motor applications when modified by installation of a flexible coupling half on each end. As motor-driven unit, drive is rated 7½ to 15 hp for 1200-rpm drive speed and at 25 to 50 hp for 1800 rpm—*American Blower Corp, Detroit 32, Mich*

Lubricant called Lubri-Bond A, offered in spray can, is a resin-base material which operates in a temperature range of –300 F to +500 F and is said to be suitable for parts operating at high speeds and extremely high loads. Lubricant dries in 30 min and can be used in conjunction with oils and greases where oil is necessary as a cooling agent; it can be used alone where cooling is not a necessary function of the lubricant. 12-oz container costs $3.50.

Electrofilm, Inc, PO Box 106, North Hollywood, Calif

Indexable-insert tool, Style KSDN, is designed for turning, profiling, and chamfering in either direction. Tool is available with either a 7° positive or a 5° negative back rake. Both types accommodate square throw-away inserts.

Kennametal, Inc, Latrobe, Penna

Improved load cells have been reduced in size from former models. Type SR-4 universal-type cells of 50, 100, and 200-lb capacity are designed with linearity improved 100% over previous models. Type U-1-B cells, in which principle of bonded resistance wire stain gage is uti-

MEEHANITE CASTINGS ARE MADE ONLY BY MEEHANITE FOUNDRIES

The American Laundry Machinery Co., Rochester, N. Y.
Atlas Foundry Co., Detroit, Mich.
Banner Iron Works, St. Louis, Mo.
Barnett Foundry & Machine Co., Irvington and Dover, N. J.
Centrifugally Cast Products Div., The Shenango Furnace Co., Dover, Ohio
Blackmer Pump Co., Grand Rapids, Mich.
Compton Foundry, Compton, Calif.
Continental Gin Co., Birmingham, Ala.
The Cooper-Bessemer Corp., Mt. Vernon, Ohio and Grove City, Pa.
Crawford & Doherty Foundry Co., Portland, Ore.
DeLaval Steam Turbine Co., Trenton, N. J.
Empire Pattern & Foundry Co., Tulsa, Okla.
Florence Pipe Foundry & Machine Co., Florence, N. J.
Fulton Foundry & Machines Co., Inc., Cleveland, Ohio
General Foundry & Mfg. Co., Flint, Mich.
Georgia Iron Works, Augusta, Ga.
Greenlee Foundry Co., Chicago, Ill.
The Hamilton Foundry & Machine Co., Hamilton, Ohio
Hardinge Company, Inc., New York, N. Y.
Hardinge Manufacturing Co., York, Pa.
Johnstone Foundries, Inc., Grove City, Pa.
Kanawha Manufacturing Co., Charleston, W. Va.
Kennedy Van Saun Mfg. & Eng. Corp., Danville, Pa.
Koehring Co., Milwaukee, Wis.
Lincoln Foundry Corp., Los Angeles, Calif.
Mattison Machine Works, Rockford, Ill.
Palmyra Foundry Co., Inc., Palmyra, N. J.
The Henry Perkins Co., Bridgewater, Mass.
Pohlman Foundry Co., Inc., Buffalo, N. Y.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Sonith Industries, Inc., Indianapolis, Ind.
Standard Foundry Co., Worcester, Mass.
The Stearns-Roger Mfg. Co., Denver, Colo.
Valley Iron Works, Inc., St. Paul, Minn.
Vulcan Foundry Co., Oakland, Calif.
Dorr-Oliver-Long, Ltd., Orillia, Ontario
Hartley Foundry Div., London Concrete Machinery Co., Ltd., Brantford, Ontario
Otis Elevator Co., Ltd., Hamilton, Ontario

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- **MEEHANITE DESIGN DATA BULLETIN NO. 26**
- **BULLETIN NO. 27**
- **PRINCIPLES OF HEAT TREATMENT**

Write today to Meehanite Metal Corporation, Dept. 4D, 714 North Avenue, New Rochelle, N. Y.

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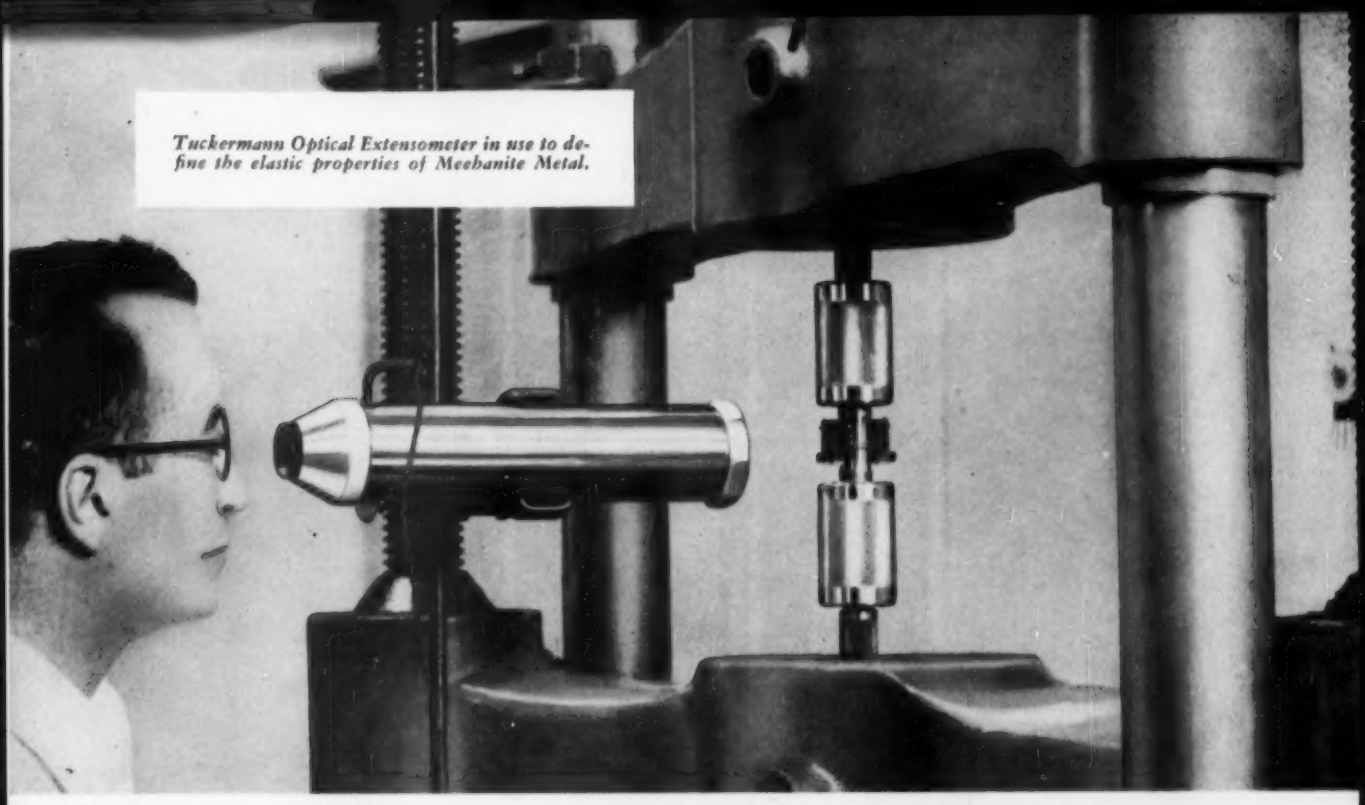
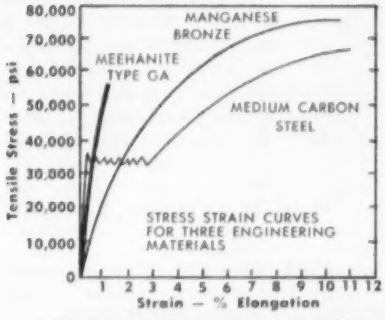


Tuckermann Optical Extensometer in use to define the elastic properties of Meehanite Metal.

MEEHANITE METAL PROVIDES DEFINED ELASTIC MODULUS VALUES FOR THE DESIGN ENGINEER



Meehanite Castings have true elastic property characteristics. Results of test data obtained from the use of sensitive strain gages have established modulus values ranging from 22,000,000 to 17,000,000 psi according to the type of Meehanite Metal. Modulus of elasticity for Type GM is 22,000,000 psi; Type GA 20,000,000 psi; Type GB 18,000,000 psi; Type GC 17,000,000 psi.

The data also demonstrates that true elasticity persists up to loads approximating one-third of the tensile strength of the metal. Design with confidence. Specify Meehanite Metal for your casting requirements. For additional information, write for Meehanite Design Data, Bulletins No. 26 and No. 27 today.

High modulus with resistance to elastic deformation is important in these Meehanite extension parallels where maintenance of required dimensions is essential.

Dimensional stability and high resilience of Meehanite Castings is typified in this Wales Hole Punching unit. The superior stiffness of Meehanite Metal permitted units to be made with 8", 12" and even 16" throats.

MEEHANITE METAL®

MEEHANITE METAL CORPORATION • NEW ROCHELLE • NEW YORK

ACCO products

Wilson Diamond "Brale"* Penetrators

A Minor load penetration

B Major load penetration

C Linear measurement of penetration increase

To be SURE of your ROCKWELL* hardness test use only a

WILSON "BRALE" Penetrator

WILSON Diamond "Brale" Penetrators are precision ground under high magnification to assure mathematical and microscopic accuracy. Each is standardized on test blocks and rigidly inspected at the WILSON Standardizing Laboratory.

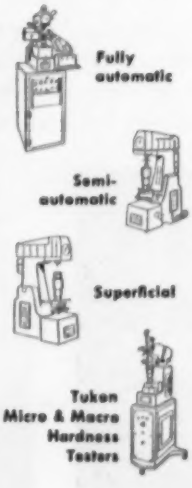
Because of this meticulous attention to manufacturing detail, WILSON Diamond "Brale" Penetrators provide the extreme accuracy demanded of an instrument where the difference between a single degree of "ROCKWELL" reading is but 0.00008" penetration.

Special "Brale" Penetrators are available for testing unique areas—the pitch line of gears, for instance, or high temperature testing. N "Brale" Penetrators are supplied for use with WILSON "ROCKWELL" Superficial Testers.

A WILSON expert on hardness testing is never more than a few hours away. Prompt WILSON service guarantees top performance from WILSON equipment.

*Trademark registered

A FULL LINE TO MEET EVERY HARDNESS TESTING REQUIREMENT



ACCO

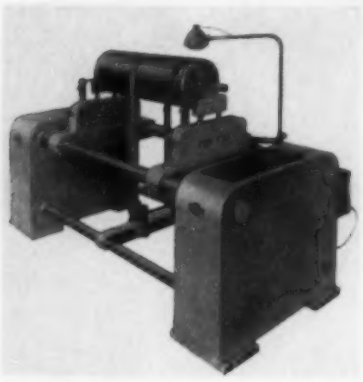
Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE

230-B Park Avenue, New York 17, N. Y.

for Better Value

lized, are 3¼ in. high and 3½ in. in dia, permitting more compact systems for measuring tension and compression loads.

Electronics & Instrumentation Div, Baldwin-Lima-Hamilton Corp, 806 Massachusetts Ave, Cambridge 39, Mass



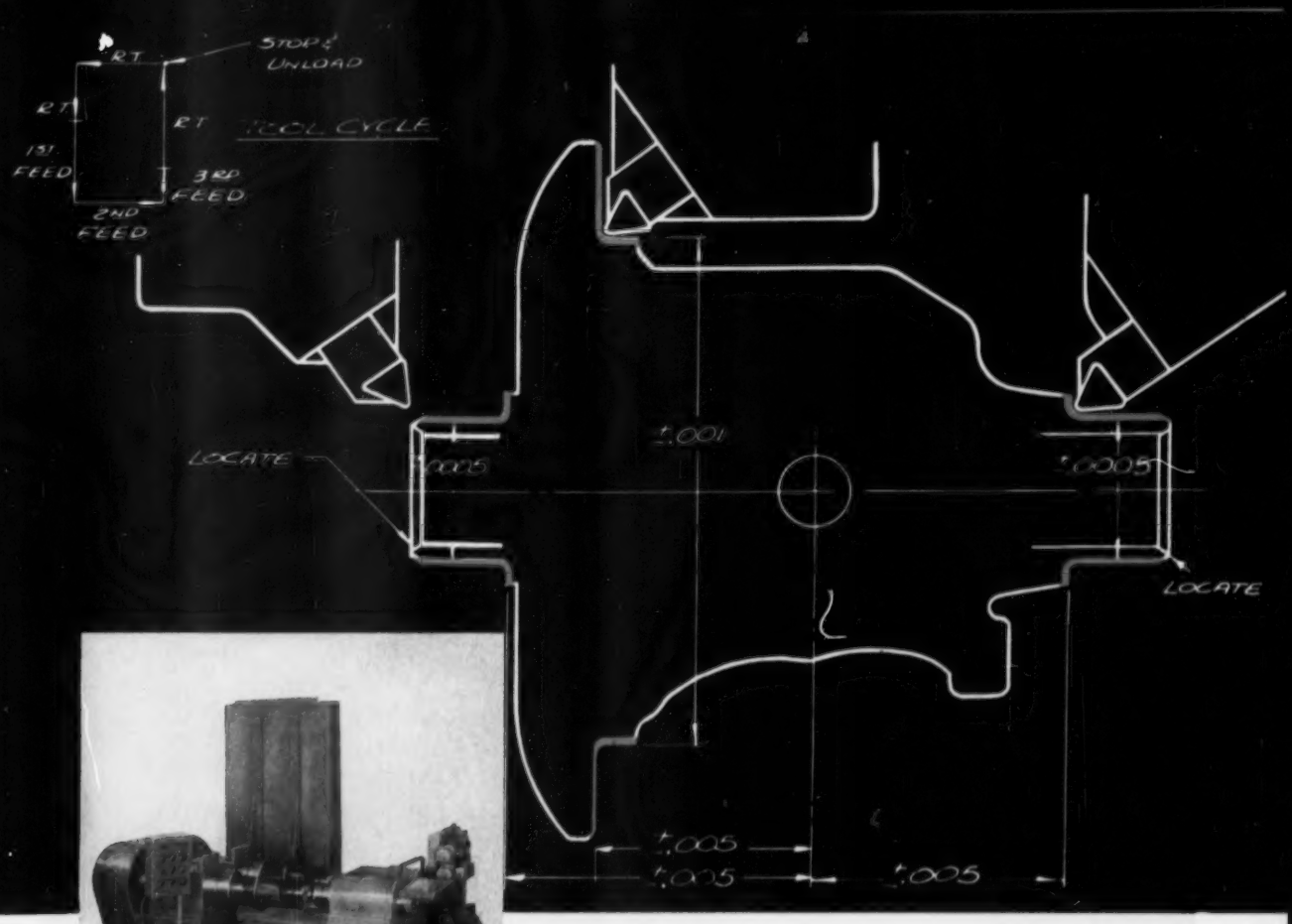
DYNAMIC BALANCING MACHINE, Series 500, is a medium-price machine designed to handle such parts as armatures, rotors, and mill rolls from 5 to 10,000 lb. Seismic free-in-space unbalance indicator is attached to work-supporting mountings on chrome balls and raceways which provide over 4 in. of free amplitude travel. Unit is equipped with variable-speed drive, has max swing diameter of work of 48 in., takes work lengths up to 35 ft, and is said to require practically no maintenance—*Raydyne Corp, 920 W Laurel St, Springfield, Ill*

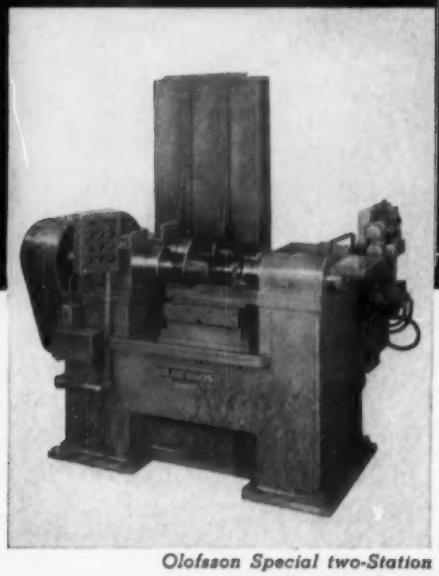
Stud driver and extractor, called the Service Bi-Way Studder, is offered in five models which are designed to fit studs ranging in size from 8-32 to ¾ in. Tool can be used for either hand or power operations, changes from a driver to an extractor by simple throw of switch. A wide variety of parts, including barrels, screws, drive heads, shift controls, and collets and pins, is offered.

E V Nielson, Inc, 129 Broad St, Stamford, Conn

Strain-gage sealer of epoxy rubber is said to reduce preparation time in strain-gage testing and to improve reliability. Designated Epoxylite 222, sealer is an alloy of liquid epoxy resin and liquid polysulfide synthetic rubber. Both components are solventless and can be mixed and cured with a catalyst at room temperature

(Continued on page 220)





Olofsson Special two-Station Precision Lathe.

Close-up view of differential cases clamped into position.

IT FIGURES!

For Your TOUGH Production Problems, Olofsson SPECIAL Machinery . . .

For example, this *2 Station Precision Lathe* can finish face and turn two hubs, and finish face and turn the flange on an automobile differential case, cast of cylinder iron, *at the rate of 60 per hour.* This production is possible because the design reduces operator fatigue and human error, provides push button operation.

Here's How It Works . . . The operator inserts a dog driver bar into the part, loads both stations of the machine and pushes the combination clamp, start-cycle button. That's all there is to it until the parts are ready for unloading.

For low tool replacement costs and quick change, the new type throw-away carbide cutting tool inserts are used. The lathe conforms to J. I. C. electrical and hydraulic standards.

If the cost of any phase of your machining operation is running too high . . . or if output is lagging . . . consult with Olofsson. You'll find it pays to "Special-ize" with Olofsson Special Machinery.

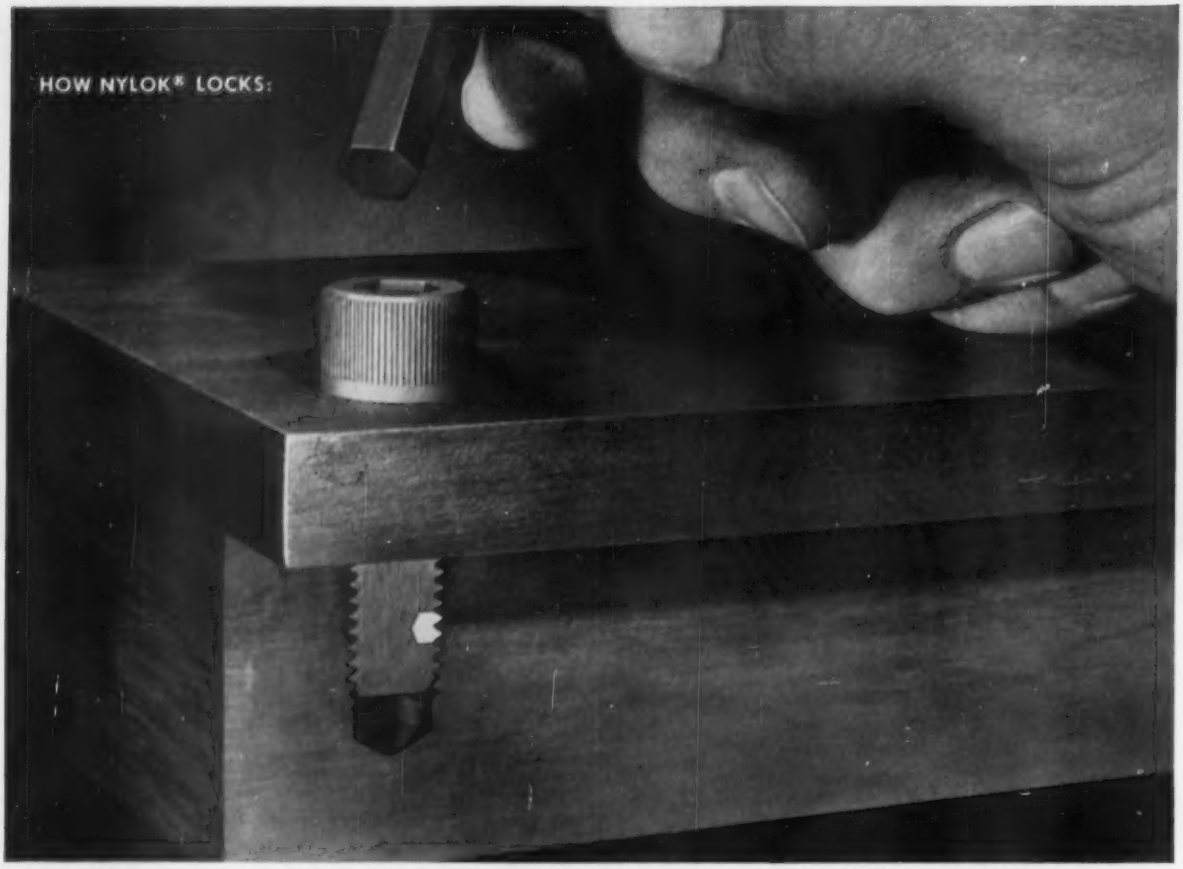
Today, put the Olofsson Engineering department to work for you. A letter or phone call will do it.

THE OLOFSSON CORPORATION

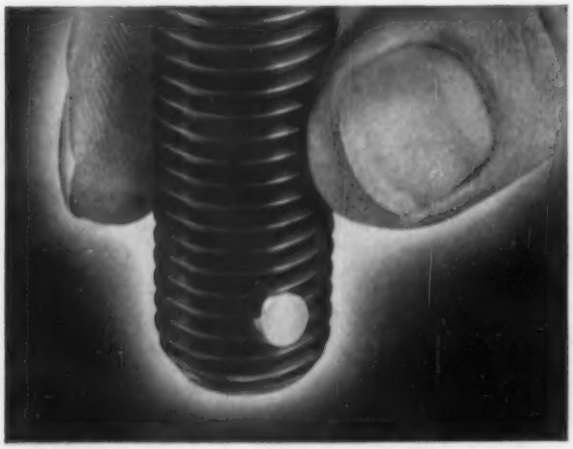
2728 Lyons Avenue, Lansing, Michigan

Manufacturers of Special and Automation Machinery, Standard-Index Tables, Drill Units, and Precision Boring Machines.

NEW—a complete line of socket screw products



LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together, and locks the screw securely.



BEFORE ASSEMBLY. The nylon pellet projects slightly beyond male threads. When assembled, female threads will be impressed into it. Pellet locks effectively whether the screw is seated or not.

AFTER REMOVAL. "Plastic memory" of pellet has expanded impressed threads to greater diameter than screw threads. Screw can be used repeatedly. In use, "memory" keeps threads tightly locked.

self-locking UNBRAKO that won't work loose

They simplify design and save production time

UNBRAKO socket screws are now available embodying the Nylok* self-locking principle. Nylok provides a truly practical new solution to the problem of making screws self-locking.

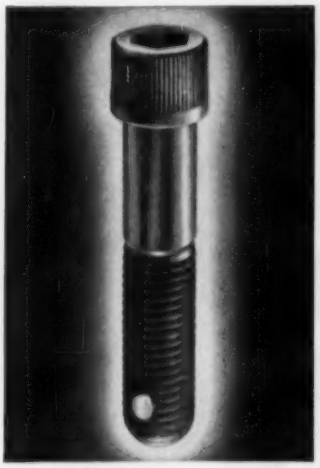
An UNBRAKO screw with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Just thread the UNBRAKO into any tapped hole. *Seated or not*, it locks positively wherever wrenching stops. The tough, resilient nylon pellet forces mating threads together and holds tight. The screw will not shake loose.

You save production time when you build products with self-locking UNBRAKOs. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. So are cotter pins and complex multiple set screw installations.

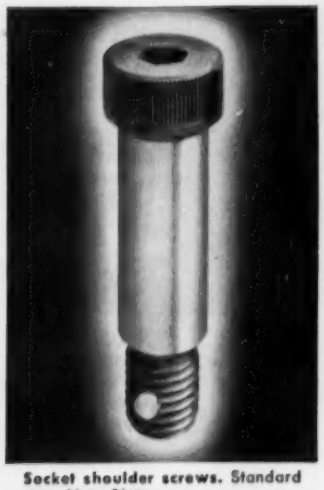
Self-locking UNBRAKOs are completely reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, on properly seated screws, the pellet acts as a liquid seal.

Self-locking UNBRAKO socket screws come in a complete range of standard sizes and materials. See your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

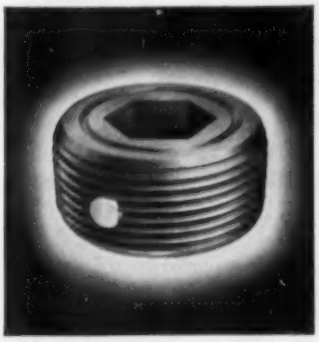
**T.M. Reg. U.S. Pat. Off., The Nylok Corporation*



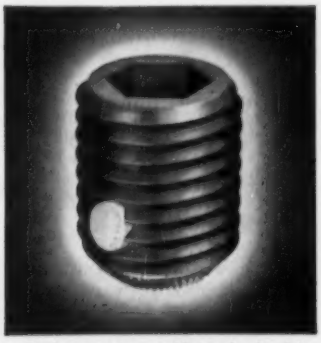
Socket head cap screws. Standard sizes # 6 to 1 in.



Socket shoulder screws. Standard sizes ¼ to ¾ in.

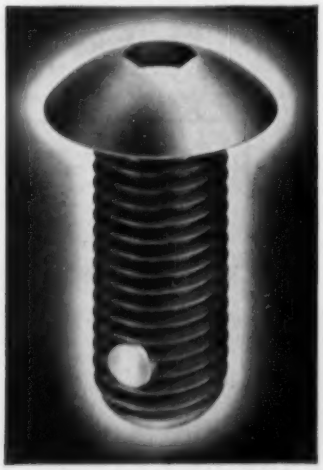


Socket pressure plugs. Standard sizes ⅛ to 1¼ in.



Socket set screws. All standard point types. Standard sizes # 6 to 1 in.

Flat head socket screws. Standard sizes # 6 to ¾ in.



Button head socket screws. Standard sizes # 6 to ⅜ in.

UNBRAKO SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

NELCO CARBIDE TIPPED MILLING CUTTERS . . . CUT YOUR OVERHEAD!

You DON'T grind steel with a diamond wheel — when you use NELCO Cutters!
All carbide cutting surfaces overhang steel body!
NELCO sandwich braze guarantees a rugged, one piece cutter that works to close tolerances, can't chatter, teeth don't work loose!
NELCO pioneered slash milled design —gives more chip clearance—means less grinding— gives greater production between grinds!
Gang cutting made simple— slot, maintain width with multiple cutters and shims!

Those who buy tools for lasting performance as well as initial appearance always specify "Nelco". These carbide tipped Milling Cutters are precision built for rugged dependability, engineered to "take it"—singly or in gangs —to save *real money*, deliver fast and accurate results without the operational and maintenance "headaches" of most conventional cutters. Look for benefits *and* appearance—call for Nelco—your distributor has the size and type you need in stock.

SEND TODAY for 24 page manual— Suggestions for Operating and Maintaining NELCO TOOLS! Contains illustrated instructions for regrinding with operating charts and data.

NELCO TOOLS

For that EXTRA Edge in Production!

NELCO TOOL CO., Inc. • Manchester, Conn.

NEW SHOP EQUIPMENT

to form a tough, resilient plastic. Sealer is reported virtually impervious to water and moisture.

Epoxylite Corp, 10829 E Central Ave, El Monte, Calif

ELECTRIC TRACTOR complete with two 6-cell 13-plate lead acid batteries, weighs only 1620 lb and has traction speeds of 6.5 mph empty and 5.2 mph pulling a 5000-lb load. Tractor has 4 speeds forward and reverse. Over-all length is 49 in., over-all width 32 in. Normal drawbar pull is 250 lb, maximum is 600 lb—*Lewis-Shepard Products, Inc, Dept R-24, Watertown, Mass*

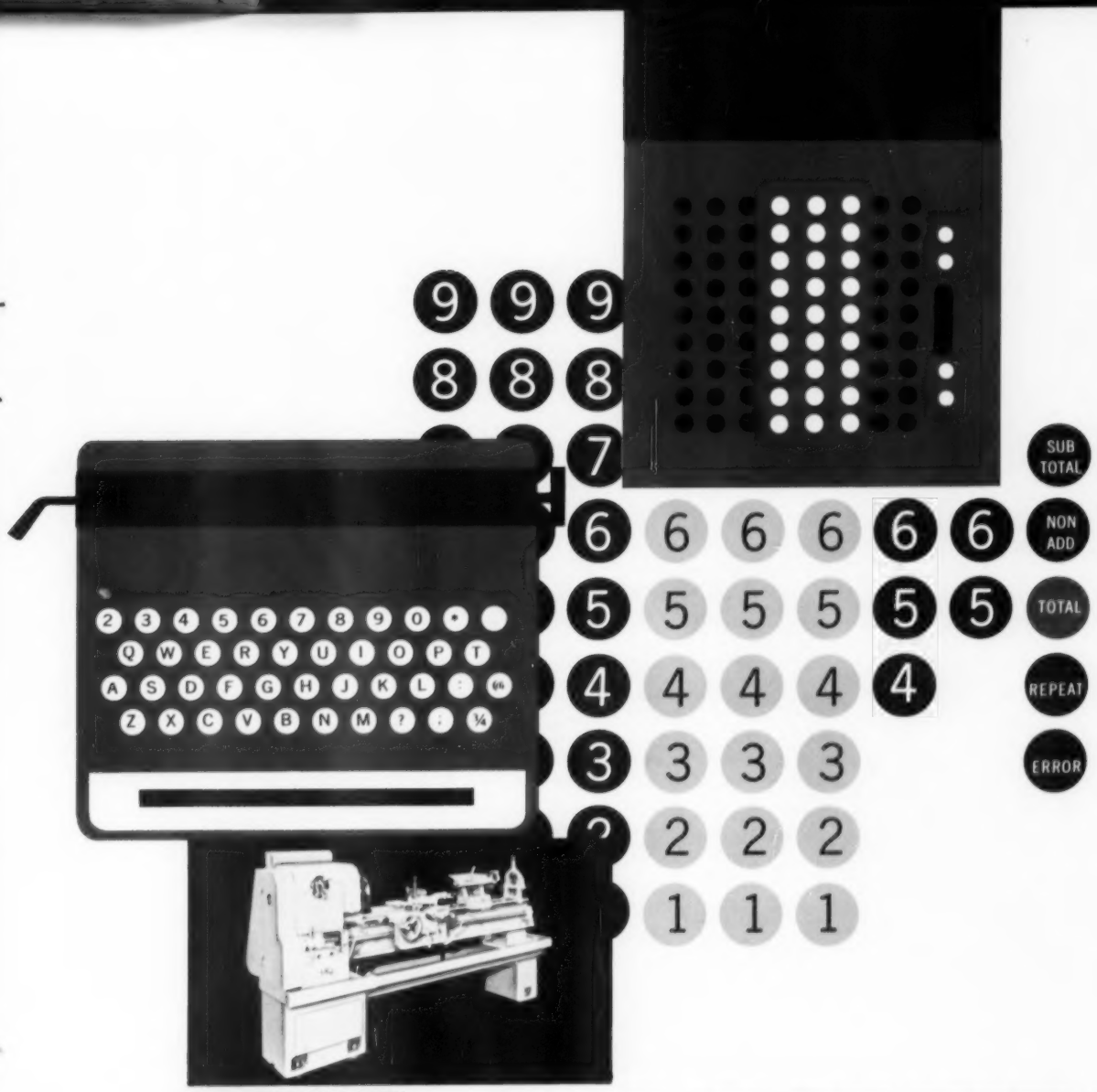
Vinyl protective coating, called Zip Kote, can be sprayed or brushed on paint spray booths. Product can then be peeled off, removing paint deposit with it and leaving booth clean. Coating dries fast; is white in color, providing reflective light in booth; will not support combustion when dry; and does not lose its elasticity, even when subjected to heat as high as 290 F for a long perid.

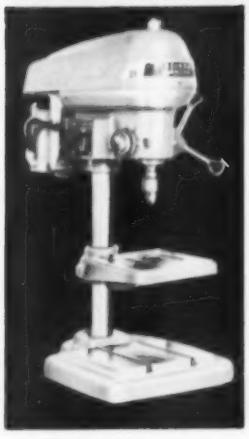
Klem Chemicals, Inc, 14401 Lanson Ave, Dearborn, Mich

Weight slide rule figures the weight of any shaped object from known dimensions. Calculations cover most materials, including aluminum, cast iron, steel, brass, copper, and lead. Almost any shape can be figured. Tool has anodized aluminum face with black graduations, instruction booklet is furnished. Price is $25.

American Pattern, 772 Bryant St, San Francisco 7, Calif

Fire-resistant hydraulic fluid will not burn on contact with flames, heated metal surfaces, or molten metal. Called Irus Fluid 902, it is a special formulation of water, petroleum oil, and emulsifying agents, and is recommended for use where hydraulic





BUSINESS MACHINE MANUFACTURERS have calculated the risk of obsolete machine tools and started dynamic replacement programs. They know that over half the 9,000 drilling machines and 9,000 lathes were built to World War II standards.* In fact, over half the machine tools in America are over a decade old. The penalty of this is easy to see in the lower prices of your alert competitors and in our country's position in freedom's fight.

Yet modernization is quick and inexpensive with "Standard Machine Tools" developed against fresh, new concepts of appearance, function and accuracy. To this end, Cincinnati Lathes and Drills are built to do much of your jobbing, tooling, maintenance and light production work at tremendous savings. Write for complete catalog information. Cincinnati Lathe and Tool Co., 3247 Disney, Cincinnati 9, Ohio.

*Figures from American Machinist's Seventh Inventory.

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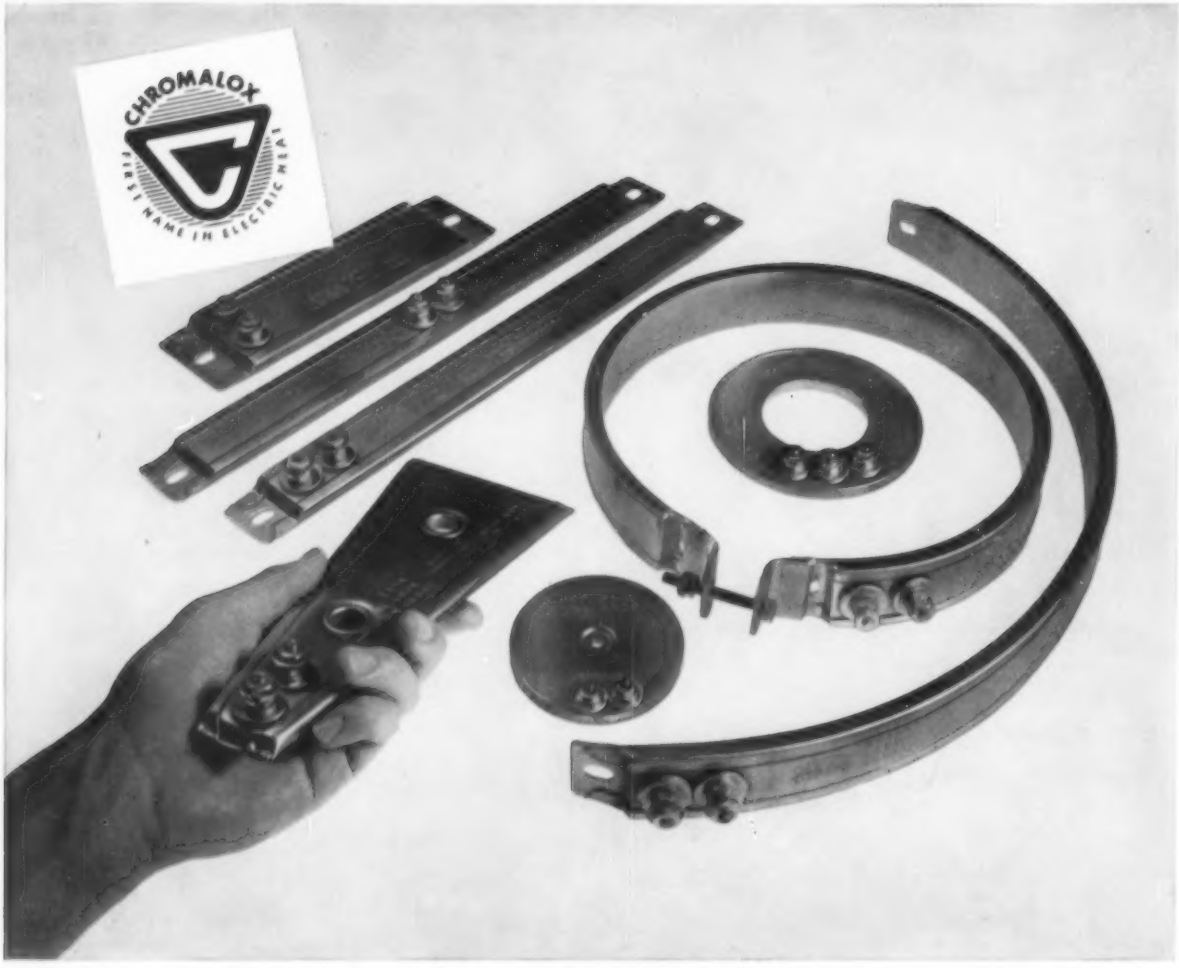
center on... **cincinnati lathes and drills**

Machines shown are Cincinnati's new 16" Royal Drill and 15" Tray-Top Lathe.



industry's most versatile heat source . . . Chromalox Electric Strip Heaters

Chromalox Electric Strip Heaters provide uniform, precise heat to fit the size and shape of your production equipment. For heating platens, dies, kettles, tanks, pipes, ovens, air ducts . . . there's a Chromalox Electric Strip Heater to provide the many advantages obtained only with electric heat. Low initial cost; quick, easy installation with standard bolts or clamps; long, maintenance-free heater life at low operating cost. Instant heat-up. Accurately maintained temperatures on each machine, by either automatic or manual control.

For the full story on Chromalox Electric Strip Heaters, call your Chromalox Representative, or, write today for Bulletin F1566.

Edwin L. Wiegand Company
7577 Thomas Boulevard, Pittsburgh 8, Pa.

B-716A

Standard stock elements for immediate delivery

Lengths—4" to 96" Widths—¼" to 2½"
Ring diameters—2½" to 11"
115 to 480 volts 35 to 5000 watts

Sheath materials—rust-resisting iron, high temperature chrome steel or Monel.

For clamping to pipes, tanks and other curved surfaces, you may specify either cross-section curving or lengthwise bending.

Terminals may be positioned to meet your operating requirements.

By addition of secondary insulating bushings, heaters may be connected in series, where voltage is above 480 volts.

leaks or line ruptures would cause fire or explosion hazards. Fluid is said to release its water content as a protective steam blanket to quench fire. It is reported to possess all the petroleum hydraulic-oil characteristics vital to proper functioning of hydraulically operated machinery.

Shell Oil Co, 50 W 50th St, New York 22, NY

NUMBERING HEADS incorporate manual ratchet control which enables new numbering sequences to be set quickly. Units are available in custom or standard model. Custom model is constructed to customer's specifications, and incorporates any number of wheels, numbers, symbols, or codes. Heads reportedly can be adapted to fit any conventional press or marking machine—*Parker Stamp Works, Inc, Hartford, Conn*

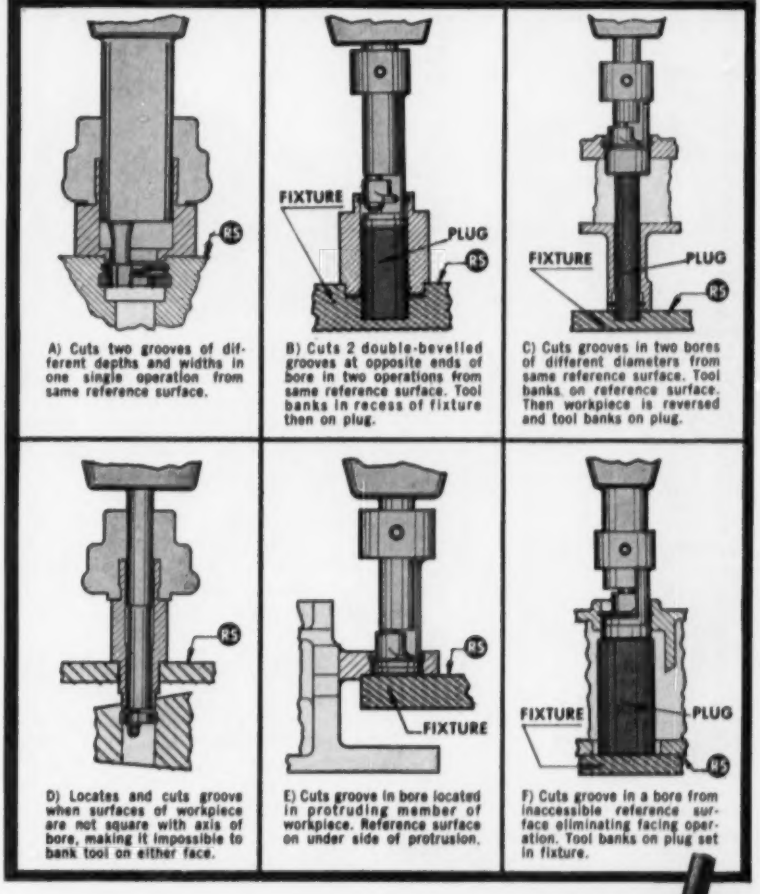
Flat-ground steels for gages and dies, both oil-hardening and air-hardening type, feature precision grinding and high micro finish, and are offered in standard 18- and 36-in. lengths in a wide range of thicknesses and widths. Special sizes are produced on order.

Vulcan Crucible Steel Div, H K Porter Co, Inc, 330 Minton St, Aliquippa, Penna

Drilling tool called Roto-Bor is designed for drilling lightweight materials from 0.001-in. to 10-gage. Tool cuts from outside of the circle in, producing hole without distortion and almost burr-free. Because practically no torque is developed by cutting process, work may be held by hand without need of vises or clamps. Tool is available in single tools or sets in sizes 1/32 in. over standard from 3/16 to ¾ in. and in specials from ⅞ to 1¼ in.

Jancy Engineering Co, Davenport, Iowa

Even Unskilled Labor Can Use This Versatile Tool Accurately! It Simplifies Internal Grooving Problems, Cuts Production Costs!



A) Cuts two grooves of different depths and widths in one single operation from same reference surface.

B) Cuts 2 double-bevelled grooves at opposite ends of bore in two operations from same reference surface. Tool banks in recess of fixture then on plug.

C) Cuts grooves in two bores of different diameters from same reference surface. Tool banks on reference surface. Then workpiece is reversed and tool banks on plug.

D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.

E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.

F) Cuts groove in a bore from inaccessible reference surface eliminating facing operation. Tool banks on plug set in fixture.

Amazingly versatile! Your toughest recess cutting problems can be met simply and efficiently with the Waldes Truarc Grooving Tool because it offers a whole range of possibilities beyond the range of ordinary recessing tools.

Wide Cutting Range! The Waldes Truarc Grooving Tool comes in 5 models...enabling you to cut accurate grooves in housings with diameters from .250 to 5.00 inches.

Send Your Problems to Waldes! Send us your blueprints...let Waldes Truarc Engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job. There is no obligation!

Write NOW for a 20-page manual containing full information on Waldes Truarc Grooving Tool

WALDES TRUARC® GROOVING TOOL

Made by the Manufacturers of Waldes Truarc Retaining Rings
WALDES KOHINOOR, INC., 47-16 Austel Place, L. I. C. 1, N. Y.
Waldes Truarc Grooving Tool Manufactured Under U. S. Pat. 2,611,425

AMI 10/8

Waldes Kohinoor, Inc., 47-16 Austel Pl., L.I.C. 1, N. Y.

Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool. (GT-2-53)

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4 lines of automatic machines integrated into LOW COST AUTOMATION for every production application.

1. The H. P. TOWNSEND MANUFACTURING CO.
• High-Speed Shavers • Riveters • Automatic Screw Machines • Special Machines

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3. CLEVELAND TAPPING MACHINE CO.
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Call on H. P. Townsend's specialists in mechanization. By drawing on Townsend of Hartford's extensive library of "*Mass Production Case Histories*" these specialists can show you proven applications for savings in operations, machining time, materials handling and direct labor. Big savings for you.

Townsend's broad line assures you of impartial recommendation of the best machine to improve your volume production.

Address prints or samples to: Robert Nichols.

The H. P. TOWNSEND MANUFACTURING CO.
ELMWOOD, CONNECTICUT

NEW SHOP EQUIPMENT

DIAL-INDICATOR CALIBRATOR checks the accuracy of dial indicators. Device incorporates plunger driven by a hardened wedge and a precision screw. Screw is operated by two dials: outboard dial, for fine control, is graduated to 0.000025 in.; inboard dial, for rapid travel, is knurled and drives screw through a set of planetary gears. Range is 0 to ½-in. travel of indicators —*Custom Scientific Instruments, Inc, Kearny, NJ*

Anti-static coating for industrial equipment, Gencote 108, utilizes Teflon as the base material, retaining all its characteristics but reversing the electrical-insulation feature to create electrical conduction. On such equipment as conveyors, material permits powders to flow freely; it can be used to reduce friction on a variety of machines. Surfaces can be coated in multiples of ½ up to 10 mils on any metal or other material which can withstand temperature of 700 F, required for the baking process.

General Plastics Corporation, Paterson, NJ

Electric motor is offered in series designated Frame 566. Design combines 56-frame components and a base intended to give the shaft height and location of mounting holes of a standard 66 frame. Oversize bearing on shaft end provides for ¾-in.-dia shaft extension. Unit provides 66-frame service at a price only slightly higher than 55-frame.

Doerr Electric Corp, Cedarburg, Wis

Double-ended stud called Schweppe Stud cuts its own thread when driven in an ordinary drilled hole, and locks securely in the same operation. Studs can be installed with any

how to trap dust
that damages your machines and hurts company morale

Priced from $190.00

easy-to-move
TORIT DUST COLLECTORS
trap dust at its source!

Untrapped dust costs you money, "secretly" forces precision machines out of line, limits production. Torit dust collectors are unitized for custom installation—save more money, usually more efficient than central (built-into-the-building) system. Torit unit operates only when machine or combination of machines it protects are in use. Filtered air may be returned to room to save heat. Many models and sizes, all self-contained, easy to move. Write today to...

TORIT MANUFACTURING COMPANY

Sweet's

Dept. 406
311 Walnut Street
St. Paul 2, Minn.

How optical gaging helps get Giannini air-borne instrument production off the ground faster.

In the fight for flight that's higher, farther, faster—plane and missile makers want everything smaller, lighter, tighter. Tighter means tolerances today of 0.0002″ to 0.0003″ compared to 0.003″ to 0.004″ a few years ago. That's why more and more manufacturers like aircraft and missile instrument and control maker G. M. Giannini & Co., Inc., Pasadena, Calif., are using Kodak Contour Projectors.

A pulley in one Giannini instrument is less than pencil eraser size, has groove dimension tolerance falling between 0.010″ and 0.011″, four separate angles to check out within 0.30°, a shaft diameter of plus or minus 0.0001″ or 0.0002″. Perpendicularity must be within 0.0003″. Like many aircraft parts, it's made of aluminum alloy.

Before Giannini put a Kodak Contour Projector to work on receiving inspection, getting prototypes of instruments filled with parts like this—and even tighter—used to be a mammoth problem. An undetected off-tolerance part in the master could hold up production or even throw production models out of kilter.

At Giannini, inspectors check incoming parts quickly and accurately with optical gaging, make sure they're right for the prototype. They optically check angles, shoulders, radii, positions, and all critical surfaces on a single projector. Now there's less chance than ever that production parts will be off tolerance once the master has been approved.

If inspecting small parts to tiny tolerances is a large problem with you, you should investigate optical gaging with a Kodak Contour Projector. A Kodak Contour Projector can work production and quality control miracles where control of measurements makes a better product.

Write for your copy of "Projection Gaging with Kodak Contour Projectors." Even better, ask for the name of your nearest representative, so he can personally explain projection gaging's scope and capabilities.

Inspectors quickly learn optical gaging, because it's simply a matter of looking and comparing. Perhaps you can greatly improve Toolroom, Receiving, Production, and Final inspection with a single unit. There are six models to choose from.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADE-MARK

GOSS and DE LEEUW
AUTOMATIC CHUCKING MACHINE

means a complete piece... at each index cycle

When a piece is finished it is *completely* finished without the necessity of a second operation. Furthermore, it means *more* finished pieces in a given period of time and greater accuracy in *every* finished piece.

The "1-2-3" Method is exclusive with Goss & DeLeeuw. With it, three ends of a piece can be machined at a single chucking of the work, simultaneously or in sequence depending on the operations involved. It will pay you to investigate.

Send for illustrated literature giving detailed information. Send samples and ask us to give you cost estimates of handling this work on a "1-2-3" Goss & DeLeeuw Automatic Chucking Machine.

GOSS & DeLEEUW

GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

power stud driver; no special adapters are needed. Devices are reusable, can be removed from hole without thread damage. Studs are made with hard rolled threads in any desired style at each end, are supplied in any length, and can be furnished in any diameter from No. 4 through 1 in.

Pheoll Mfg Co, 5720 Roosevelt Rd, Chicago 50, Ill

Automatic selenium battery charger is intended for on-location charging of lead-acid or nickel-alkaline industrial truck batteries. Throwing a toggle switch adapts it for batteries of either type. Called the Rectox, charger has automatic control of charging rate after initial setting is made, automatic shutdown when battery is charged, and automatic shutdown in the event of ac power interruption. Capacity range is batteries from 200 to 675 amp-hr.

Westinghouse Electric Corp, Box 2278, Pittsburgh 30, Penna

Grinding coolant filters in PAG line are available in six models with capacities of from 5 to 60 gpm for filtering grinding-machine coolants. Accordion-pleated, plastic-impregnated filter elements trap particles down to a size of 10 microns, are capable of removing either ferrous or non-ferrous metal particles. Elements are easily replaceable, handle either water-soluble oils or thread-grinding compounds.

Purolator Products, Inc, Dept G, Rahway, N J

One-part epoxy resin adhesive designated EC-1386 is said to provide exceptionally high shear strengths without the necessity of adding an accelerator or catalyst. Designed for metal bonding over a service temperature range of –65 to 250 F, adhesive gives good adhesion to brass and steel as well as aluminum. No volatile by-products are given off during curing cycle.

Adhesives & Coatings Div, Minnesota Mining & Mfg Co, 423 Piquette Ave, Detroit 2, Mich

Hand screwdriver called Palm-Grip features a ratchet said to enable leverage up to four times normal torque power. Ratchet snap-fits into the steel socket of the plastic driver handle, has an extra-wide radius which gives the added leverage.

Kipton Industries, Royersford, Penna

For Those Tough Special Jobs
Depend On

National Tool Co.

Years of successful experience in special tooling and related production problems are yours for the asking. When the job requires special cutting tools call in your National Tool Co. representative. He is backed by more than 49 years experience in the engineering and manufacture of special cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

National Tools Cleveland

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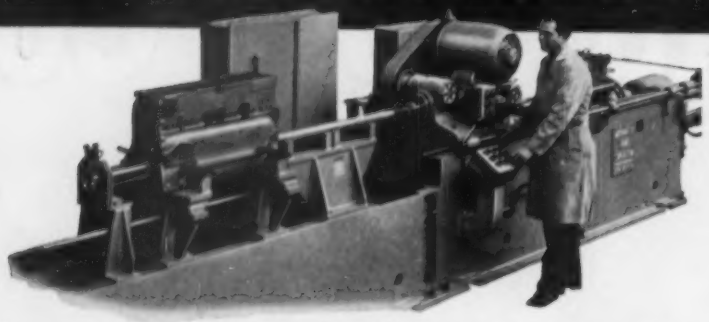
...the metal-working industry.

WHY CUMMINS main bearings are MICROHONED



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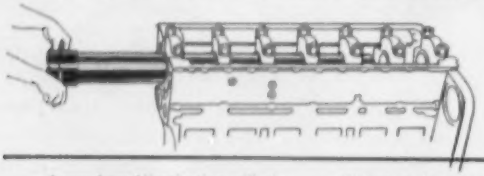
"However, by Microhoning our main bearings we secure *round, accurately-sized and aligned bores.* Cummins is the first diesel manufacturer to Microhone its main bearings. The surfaces of Microhoned bearings are clean-cut, free of deformed metal and the finish is consistent in every bore. In addition, the consistent accuracy generated by Microhoning permits us to make faster set-ups and use higher cutting feeds on preceding boring operations—Microhoning automatically corrects all inaccuracies.

"After Microhoning, all main bearing bores are checked with a gage plug 44 inches long and .0007 inch under required bore size. Gage must have a simultaneous slip-fit through all bores in the block. Tolerance for roundness is less than .0002 inch and finish is held to the specified 55 microinches."



Learn how Microhoning will give you efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
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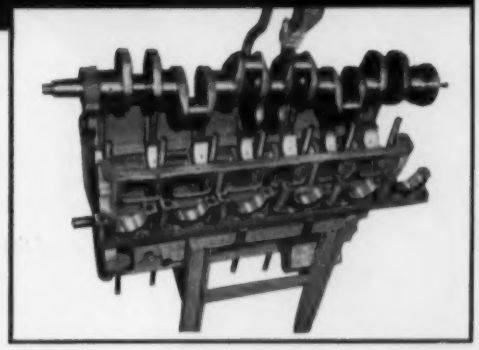
HOW MICROHONING generates round, accurate, aligned bearing bores



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A typical example of Microhoning interrupted cylindrical surfaces is the Cummins Diesel Engine application. Here's how Microhoning generates accuracy and alignment in the crankshaft main bearing bores:

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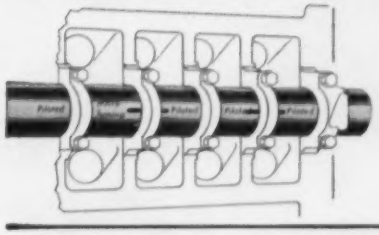

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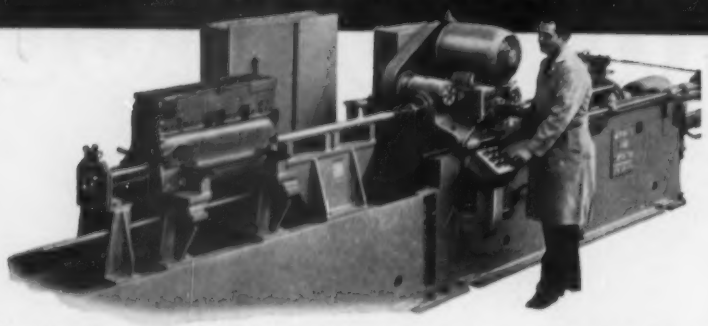

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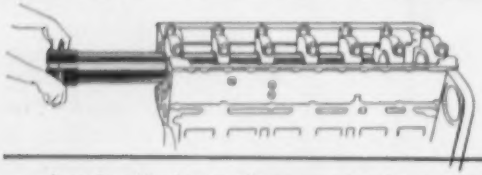

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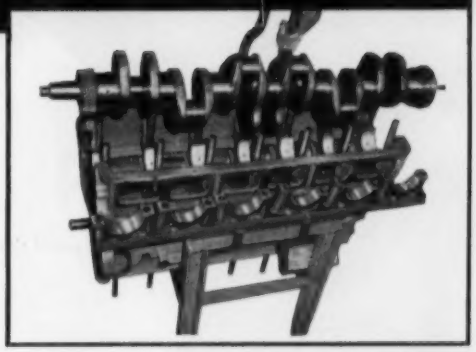

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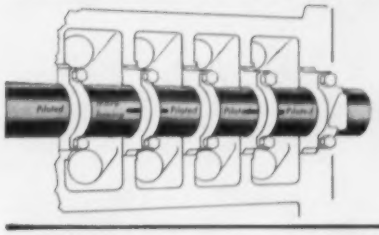

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Modified BAY STATE thread grinding wheel grooves the inner race of tiny ball bearing. Photo courtesy of Miniature Precision Bearings, Inc. at Keene, N.H.

Behind Controlled Flight . . . BAY STATE GRINDING WHEEL PRECISION!

Of tremendous importance to the effectiveness of guided missiles, jet planes, and other supersonic projectiles, is the *precise control* of their flight. The tiny instruments which give this control need unbelievably small bearings which must perform perfectly. One such ball bearing is shown full size on the page opposite.

Grinding such perfection into each ball-groove and face of these gem-like bearings demands grinding wheels with the most *dependable* uniformity of cutting action . . . in wheels down to the midgets which do their work *inside* the miniature bearings!

Electronic Formulation, the exclusive BAY STATE control which gives such complete grinding wheel uniformity, is one of the answers to this and many other grinding problems. "EF" uses the unerring accuracy of electronic computers to calculate precise amounts of each grinding wheel ingredient, and to "remember" these amounts on electronically punched cards.

Use BAY STATE as <u>your</u> source of abrasive engineering service and products to get up-to-the-minute grinding performance. Call in your local Bay State Distributor, or write directly to Bay State Abrasive Products Co., Westboro, Massachusetts. Branch Offices are located in Bristol, Conn.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.; with distributors in all principal cities.

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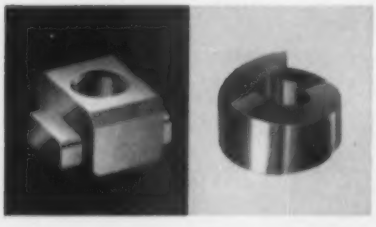

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ROUND TABLE Discussion

NO TIME TO THINK

Is it necessary for a foreman to be available at all times to answer questions, solve problems, and keep close check on the men? Or can his day be better organized so that he has time to read, study reports, plan schedules, etc?

IF AL IS a responsible foreman in full charge of a section or sections, there should be no need for him to answer all the questions his men might come up with. Presumably, he will have an assistant or a charge hand who should be able to answer all but major questions. It will be part of Al's job to instruct the assistant in such matters and to satisfy himself regarding his ability to fill the bill.

It is manifestly absurd and rank bad management if a senior executive is at the beck and call of every man in the shop. Lack of confidence is a common failing among the rank and file when decisions have to be taken. It is not that many of them have no brains. Many of them know the answers to the questions they ask about their work but don't trust their own judgment. They don't believe their beliefs and doubt their doubts; more often they believe their doubts and doubt their beliefs. They need confirmation, they need someone to *tell* them.

Al is right in refusing to be a crutch for the men to lean on, but

"Whadaya mean you're afraid to go up . . . I'm holding it ain't I . . . ?"

I don't believe they are too lazy to think for themselves. I believe many of them lack confidence where decisions about work are concerned and fear making mistakes which won't be dealt with on the *red* carpet.

There are also those who like to give the impression of being persona grata with the chief and who take every opportunity to engage him in conversation. That is a form of vanity which should be firmly discouraged on all occasions. All those little peculiarities and weaknesses, however, combine to give us our rank and file. If all were clever, self-reliant, and ambitious who would willingly work at machine or bench? All would want to boss others but there would then be no "others" to boss, Kismet!

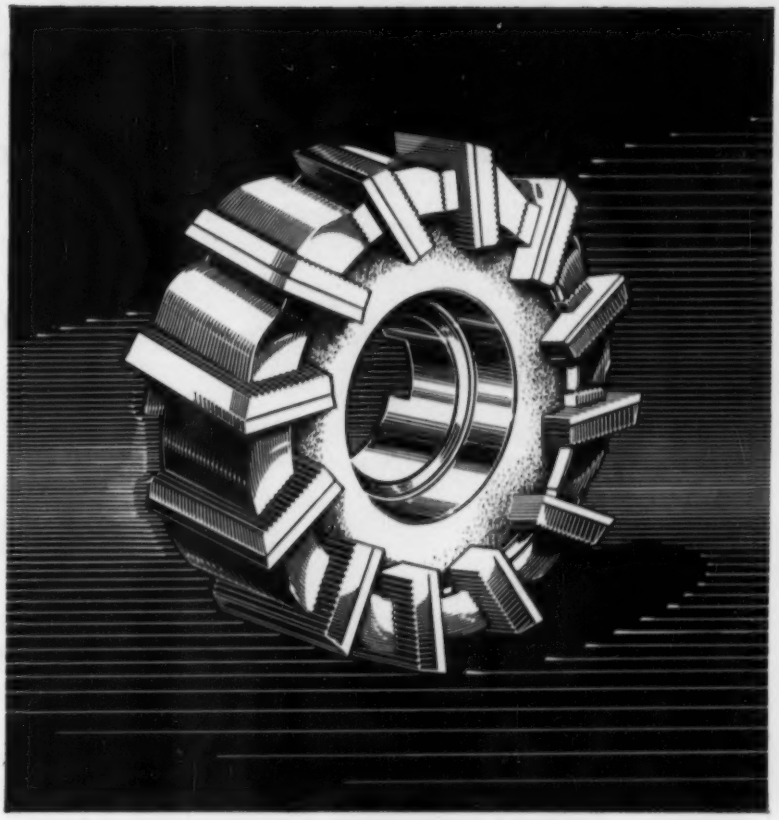
Ed is dead right in wishing to be available at all times to help his working force, but that does not mean that Ed should be available, *in person*, at all times. To a great extent, it will not be Ed who helps the working force, it will be Ed's experience and wisdom.

In common with other senior executives, Ed will have an assistant whom he should train in the way he should go in the matter of dealing with all shop affairs, short of, say, matters involving company policy. In that way, Ed will have cleared the decks so that action will not be stalled in his absence from the plant.

No foreman should be so burdened with work or worries that he cannot be absent from the plant without efficiency being impaired. If that happens, some hard thinking by the top level administration is overdue. Overdue, because the top level people should have spotted the symptoms before the condition had become chronic. There is, of course, a limit to the length of time a responsible executive can absent himself from the plant, without his absence being harmfully reflected in the running of the shops.

Competent authorities have given various answers to this problem. My experience suggests that a well organized section carrying an alert, properly instructed assistant, should function satisfactorily for three or four weeks in the absence of the senior foreman, provided both know their job. The really good foreman will know how to delegate his work in order that he may have ample time to devote to organizing the section and training an assistant who can successfully take over from him for that length of time if necessary.

Keen, confident formen normally



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Sure, that's the best description you could apply to a Go & Go inserted high-speed steel blade milling cutter. Here's a tool that's equally at home banging out high production day after day or down in the toolroom carefully carving out a new die. And you can use it on almost any material.

When blades wear, and they do, it's a simple matter to set them out, resharpen and put the cutter back in production. After you've squeezed the last bit of tool life out of the blades, just order new ones from stock and insert them in the cutter body. Blade cost is so low most shops keep several sets on hand all the time.

You can choose just about any style and size of inserted HSS blade milling cutter you'll ever need from the complete line of standards manufactured and stocked by Go & Go. For specifications, ask for Catalog "F". Go & Go also designs and manufactures special milling cutters in quantity. Check your nearest Go & Go representative for details.

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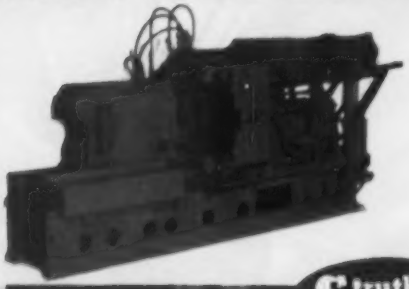

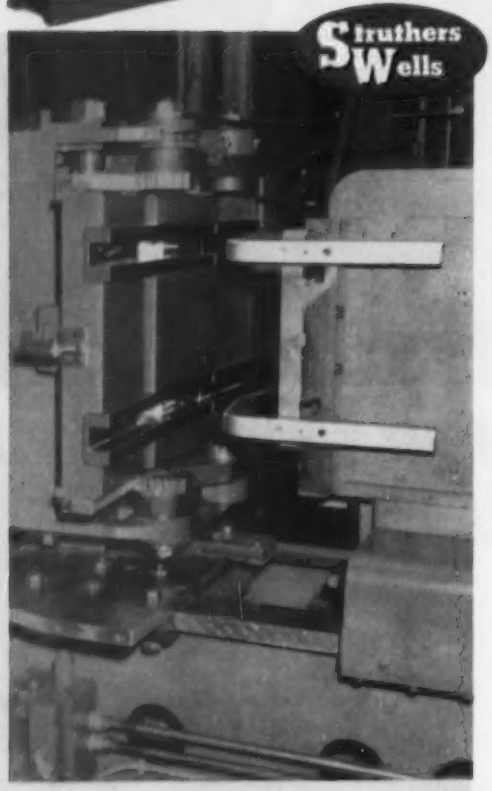

Typical of the high production delivered by Struthers Wells Tangent Benders on products for the automotive industry, are steel supports for radiators. Here, the preformed, punched and notched channel is given two smooth bends in a single cycle, two units at a time, with production running several hundred per hour. Bending capacity like this awaits *your* large-volume needs —write us!

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follow that line, secure in the knowledge of their own worth to the company, ready to meet all comers in competition and unafraid of any assistant, however bright. Only incompetent, doubting foremen keep their assistants in the dark and so pile up trouble for themselves against the time when one may be called on to take over temporarily.

I rather think that Al takes too much for granted when he expects a machinist to solve his own work problems, even the small ones, and do his own thinking. Machinists are operators and many really good operators are not good scholars or logical thinkers. One sure way to produce scrap, is to leave all operators to solve their own work problems and do all their own thinking.

To be sure, some can be so trusted but, in my experience, the majority definitely cannot. There should always be someone on the shop floor competent to make decisions, not necessarily the chief. Regarding problems on well planned, well organized production, there shouldn't be any for operators to solve; the planning section should see to that. Producing is the operator's job; nothing—thinking or problems—should be allowed to stand in the way of that.

C D Mackinnon
Glasgow, Scotland

There is something wrong with the foreman or supervisor who feels he must stand over the employee to get the work out. He evidently does not trust the employees and they do not trust him.

I see a lack of training in this department. An effective training program includes emphasis on the re-

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Mark 1000 or more units per hour on an infinite variety of surfaces, flat, round or curved—with absolute uniformity of depth of impression throughout longest production runs.

...PARKER #710 makes marking a production line operation

TYPICAL CASE HISTORIES

MARKING SPOONS
Using Parker #100 "standard" insert roll die holder and interchangeable segment type. The machine table's "cushioning" effect, plus proper set-up, compensated for the curvature of the spoon.

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800-1000 marked pieces per hour on thin walled aluminum shells with Parker tooling, custom built for use on the Parker #710.

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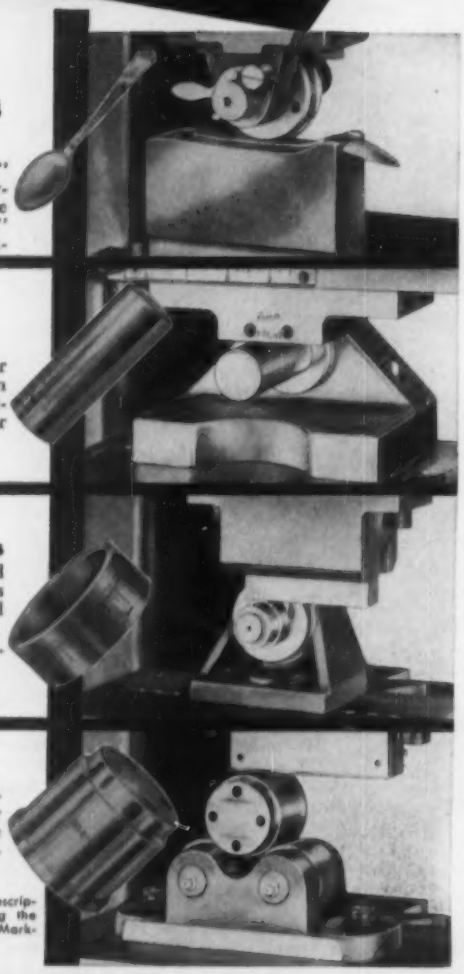
Using a standard Parker stud arbor, the precision graduations were easily indented in this steel collar. Depth of mark was close ly held to specified tolerances.

SOLID ROUNDS
Marking part numbers and other legends on the outer diameter of solid rounds is no problem. Standard Parker roller bearing cradles are used on this production run.



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MARKING DIE & MACHINERY DIV.
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by Parker

sponsibilities of the employees to the company. Industry is constantly striving to make the employees' association with the company mean something more than the pay envelope or the job. An understanding and cooperation between employees and foremen is of the utmost importance to the success of any business.

The industrial engineer had a lot of good ideas, and Ed should take advantage of the opportunity to learn all he can. Ed certainly seems to lack some of the fundamental good principles of human relations. It is very important to get the other fellow's viewpoint and combine it with our own angle. In that way we learn from each other.

I believe that every employee should be recognized for his particular ability, and treated with some respect by the foreman. The employee should be allowed to suggest or criticize without fear of reprisal. If the foreman is fair and honest with the workers, and they do not respond to human treatment, it is time to tell them what is expected from them. To mollycoddle employes is to court sharply undesirable results.

A E Salmons
Norristown, Penna

IN MY opinion a foreman should be available at all times to answer any questions his men bring up, providing they keep the questions within reason. By that I mean he should not allow a man to run to him for help on trivial matters that only require the use of his own common sense.

There are individuals in every shop who are mentally lazy and only too willing to run for help when a simple problem presents itself. There is also the guy who has the attitude "Why should I worry about this—he gets paid for it anyway." Both types

"Wanta suggestion?"

can use up more of a foreman's time than all of the rest put together—if he lets them get away with it. Maybe Ed has allowed himself to carry both types until it has become a habit. If so, a little reorganizing could begin right here. If he only saved half an hour by cutting off his worst offenders in this respect, he could have that much time to sit down and look over his magazine or that special report that has been gathering dust in his desk drawer.

It is a curious thing—and most of us are guilty of it—we will spend a great deal of time and thought on the setup of a particular machine in the shop in order that an operation can be speeded up, or perhaps eliminated. But very seldom do we make a serious effort to think over the day's events in an effort to eliminate some of the "bugs" that creep into the day's routine, and those time-consuming details that could quite very well have been taken care of by someone else. Maybe if Ed forced himself to sit down and think for a few minutes every day he would find his blood pressure getting back to normal. I believe there is a great deal of truth in the old French saying that "The man who will not use his head has to have very good legs."

It seems to me that if a man is given a blueprint and clear instructions on starting a job, whether he is a machinist or a toolmaker, he should be able to carry the job to its conclusion. Of course if the machine breaks down, or he runs into difficulty finding the proper tools, he should report to the foreman and get his advice. Unless he has other strictly personal business to discuss with the foreman, I can see no valid reason why a man should take up a foreman's time. Of course, there is a type of individual who thinks it adds to his prestige to be seen consulting the foreman. An oldtime foreman of my acquaintance had a cure for this pest that involved finding him the dirtiest job in the farthest corner of the shop. Usually one dose of the treatment was enough.

Robert S Alexander
Glastonbury, Conn

I BELIEVE that human beings are inherently and naturally lazy. This may sound a little strong but when there is more than one way to attain an objective there are few if any of us who will not take the easy way.

When a man in the shop finds that

Clearance Angle Scale — clearance angles are read directly from a graduated scale on the wheel spindle assembly.
Mechanical Wheel Dressing — an accurate radius is mechanically dressed on the grinding wheel in correct relationship to self-registering tooth rests.
Parallel Gage — end teeth are accurately aligned in a horizontal position parallel to the travel of the carriage.

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END MILL
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GRINDER ®

It can save you time in sharpening

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CENTRA-POINT'S new ball bearing carriage and workhead allow sensitive movement necessary for following helixes of small milling cutters.

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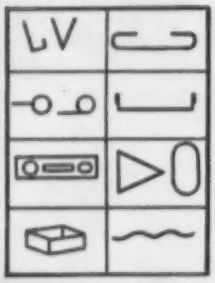
NEW DI-ACRO* PRESS BRAKE

Eliminate tie-up of a large press brake on short-run production jobs with the new Di-Acro Press Brake. It's quickly set up for experimental engineering, too. Hand operated—ample power is provided for average use by a simple cam lever mechanism, plus a power multiplying ratchet drive for heavy forming jobs.

New Di-Acro Press Brake forms 16 gauge mild sheet steel across the full 24" forming width, 10 gauge mild sheet steel across a 12" width as well as other ductile materials. Available with standard dies and specials—both are interchangeable with other press brakes.

Diagrams below illustrate typical operations with a Di-Acro Press Brake and its remarkable versatility.



WANT MORE INFORMATION?

New catalog gives complete details on all hand and power operated Di-Acro machines.

See Di-Acro Exhibit, Booth No. 1410, National Metal Exposition, Oct. 8-12, 1956, Cleveland Public Auditorium, Cleveland, Ohio.

di-acro PRECISION METALWORKING MACHINES

*Pronounced Die-ack-ro

O'NEIL-IRWIN MFG. CO.
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LAKE CITY, MINN.

his supervisor or foreman is ever ready and willing to assist him with his problems he will get in the habit of seeking this help. Once the men find a ready source of assistance the amount of thinking that they do for themselves will keep decreasing and they will be seeking more and more aid.

In addition to relieving the men of the effort attached to thinking for themselves this source of help and advice will relieve them of some responsibility.

I have worked for foremen who were always ready to answer any question and solve every problem. They had an idea that this was a good way to become indispensable, or at least a good way to *seem* indispensable. They felt that if they had a steady stream of men treking over to them and following them around the shop seeking an answer it would enhance their position and increase their supervisor's regard for them.

There may be another reason why foremen create such a situation; they may feel insecure or unimportant. In such a case the foreman creates this condition because having the men constantly seeking his help inflates his ego and makes him feel that the plant, or at least his department, could not function without him.

The foreman is there as a leader to direct and guide the activities of the men. He is not there to usurp their independence even if the men allow him to.

The good foreman never forgets the main long-range objective, namely, production and training. If he finds that the men are asking him questions which they could and should figure out for themselves, he should point out to them the simplicity of the problem and the fact that they should know the answer. Perhaps he can lead them toward the solution by asking other questions. In any case he should impress upon them the desirability of attempting to think out the problem for themselves. This must be done skilfully for he does not want to alienate them so that they will hesitate to seek help when they have a real problem.

Sing Yen
Brooklyn, NY

•

AND . . . THEY'RE OFF!

Should baseball and similar pools be forbidden in the shop? Is this a harmless form of betting that should be overlooked by the foreman? Or will it mushroom into something that may be really serious?

THE AVERAGE foreman has enough headaches in the day's work; he certainly should not gripe about a harmless baseball pool. As a matter of fact, I have never worked in any shop that did not have some mild form of gambling.

In many shops the foremen participate in the baseball pools. It is a get-together, good-fellowship sport with very little money involved. A pool properly organized need not hurt production. I think we should all be happy that the average man will take a gamble. We are all gamblers at heart. We would never get anywhere if we did not take a chance. After all, we cannot steal second base if our feet are glued to first. The worker needs some relaxation and fun.

The best way to get quality pro-

"O.K.! So there's a leak in your grease gun —get a new one from supply and get back to work!"

the TOUGH STEEL FRAMES and FEET

PLUS values in power

of HOWELL series one hundred motors give you

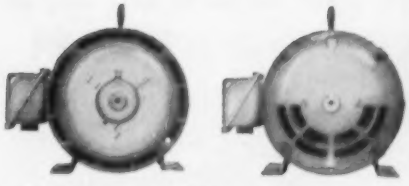
A MORE RUGGED MOTOR CONSTRUCTION, GREATER "INSTALLATION FACILITY"

The die-formed, cold-rolled steel frame of a Howell Series 100 motor takes the impact of a dropped hammer or other accidental blow with hardly a dent . . . and never a crack to show. Or take the more common installation accidents . . . too much tightening on the mounting bolts or the shock of the motor dropped too hard. Howell's steel mounting feet have the resiliency to take punishment that would crack the ordinary cast iron mountings.

In the end-plates, where rigidity is essential for constant bearing and shaft alignment, Howell uses cast iron.

It all adds up to "installation facility" . . . meaning freedom from trouble when these motors are being put to use on machines. Consider the delays and expense you can save by reducing motor damage and you'll specify the modern steel frame construction of Howell Series 100 motors every time.

GET THE PLUS values THAT COUNT....specify HOWELL series 100 motors



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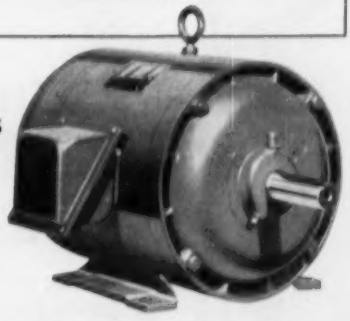
Wide slots in the stator provide 50% more contact between cooling air and stator laminations, main source of motor heat. Cool running Series 100 motors last longer.



smaller, lighter, better looking

Save machine and storage space, save shipping weight, and get new functional streamlining that matches the motor to your most modern machine design or production equipment. Why put up with dust catching fins on a motor, when sleek good appearance costs no more.

For more details on Series 100 motors, write for Bulletin N-100-R

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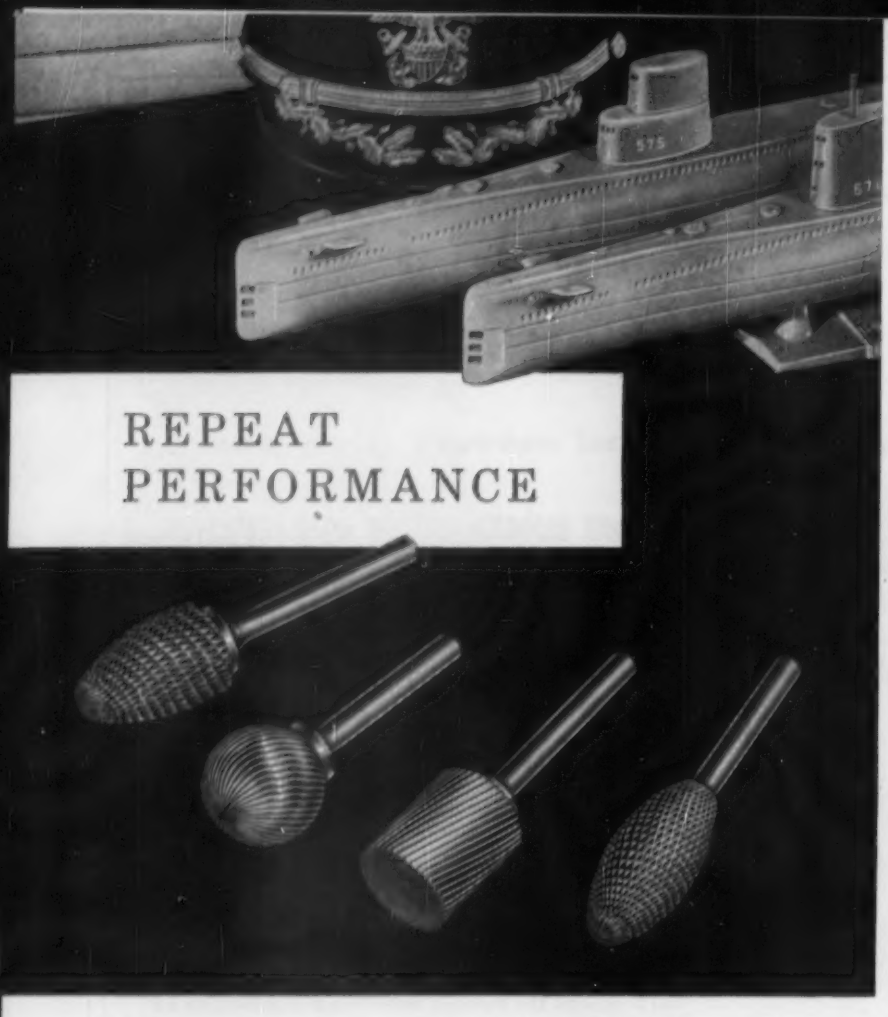
HOWELL Red Band MOTORS

HOWELL MOTORS

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN



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MACHINE TOOLS • GAGES • CUTTING TOOLS

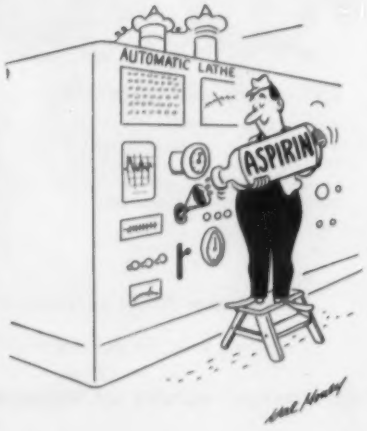
duction is to keep the employees happy. The foreman who objects to baseball pools has a chip on his shoulder. This is the quickest way to get into a fight. A chip on the shoulder is a sign of wood higher up.

A E Salmons
Norristown, Penna

IN ORDER TO reach an answer to the question of gambling in the shop we must go back to the fundamentals. We must determine the answers to such questions as why is the shop there, why are the men there?

The shop is under the control of management and they are fully responsible for everything connected with the organization. They have an obligation to the owners, to the employees, and to the public. A clear understanding of these reasons for existence and these obligations will permit management to reach a fair and just decision on this problem of gambling and on other problems. Having the answers to these basic questions firmly in mind will provide a valuable tool and will permit prompt and accurate decisions. The possession of this information by management is analogous to the possession of standards of measurement and measuring tools by the inspector. Without them he can only guess as to whether a part is to be accepted or rejected.

The shop is in existence as a result of a willingness on the part of the owner to invest the necessary capital to provide the buildings and machinery and equipment. They took this action out of a desire for a financial profit. The management is in the plant to operate it for the owners and should make every ef-



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A NORRIS-THERMADOR PRESS LINE shows bathtubs being drawn in a single operation on the versatile 6000 ton Lake Erie press at the left. The tubs move down the line where they are trimmed on a 1500 ton Lake Erie and flanged on a 3000 ton Lake Erie. Norris-Thermador Corporation serves many segments of the consumer, industrial and military markets with products from eight manufacturing plants.

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BUFFALO, N.Y. U.S.A.

No endorsement for a product is more convincing than a repeat order . . . unless it is dozens of repeat orders! Norris-Thermador purchased its first "Lake Erie" in 1940 and has since run the total to more than 80 presses. In a recent letter, Mr. Kenneth T. Norris, President of Norris-Thermador Corporation, said: "It has now been fifteen years since we installed our first Lake Erie hydraulic press and it is still operating day in and day out in an entirely satisfactory manner."

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LAKE ERIE® ● **Manufacturers of die casting machines and the most complete line of hydraulic presses for all industry.**

Now! Closer gage block tolerances give you up to 75% longer wear life at no increase in price!

Ellstrom Standards are now produced and unconditionally guaranteed to specified millionths well within the following improved gage block tolerances:

"W" Working Accuracy Blocks: +.000008", −.000002" per inch of length, with flatness and parallelism held within .000006".

"I" Inspection Accuracy Blocks: +.000004", −.000002" per inch of length, with flatness and parallelism held within .000004".

In addition to providing finer accuracy at no increase in price, these Ellstrom Standards also give you up to 75% longer wear life. For, by reducing the allowable "minus" deviation, you get an additional guaranteed wear allowance of from 2 to 6 millionths of an inch, as compared to common industry standards, before the blocks need be considered worn undersize.

Ellstrom Standards are furnished in 28 basic sets of from 8 to 92 blocks in both rectangular and square styles. Individual blocks are also available in sizes ranging from .010" to and including 20.000" to meet your particular needs. Send for complete specifications and prices today!

Set No. 35-R: "W"—$190.80; "I"—$280.50

Set No. 81-SA: "W"—$545.60; "I"—$764.35

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fort to have the plant show a profit. If management permits the men to gamble in such a manner as to interfere with productive activities, they are failing to fulfill their obligation to the owners of the plant.

A seemingly innocent activity such as a baseball pool can make deep inroads into production time. The baseball pool is a cause of constant discussion. In addition, a great deal of time is lost in passing around the scores of the games as they progress. It prevents the men from devoting their full attention to their work and results in reduced output and spoiled work.

Management should point out to the employees in an emphatic manner that they are there to earn a living for themselves by turning out the work assigned to them. They have a moral obligation to the owners and to management to turn out a fair day's work. Even in a small shop the owners will have invested $5 or $10 thousand, or frequently more, for each man employed there. Management should see to it that the machines are kept busy and that the production is not interrupted by a trivial distraction like a baseball pool.

Ernest Jones
Bronx, NY

COMPETITION in industry and the constant pressure for profitable operation causes management to narrow their viewpoint and train their sights exclusively on production. As a result, they overlook many indirect aids to increased production. If they had their way, one could go to the

"As supervisor, naturally I should ask myself questions—what bothers me, are the dumb answers I always get!"

toolcrib and ask for a ⅜-in. drill, and the machine and auxiliaries to permit the drilling of the hole.

The industrial plant means more than just production and output. The machine operators are more than just extensions of the machine controls. Management people are too far removed from the dreary monotony of the production departments to realize how necessary and how helpful a little diversion like a baseball pool can be.

Although management might like to require it, it is not possible for the employees to check their psychological equipment at the door when they report for work. They cannot trade their desires and objectives for those of the company, and the company cannot assume their problems and worries. To management, in most plants, labor is just one big, unavoidable problem. The machines can be bought, sold, and traded and always come complete with a start and stop button, and control levers which produce a definite, known response. To many companies the men are unpredictable and irrational. This condition exists in organizations where management does not take the time and effort to realize the existence of, and obtain an understanding of, the problems of the employees.

Any management which takes a broad-minded, enlightened view of the problems attached to employee-employer relations would not prohibit a baseball pool in the shop. Lunch-hour card games, gambling pools, after-hours' bowling should all be encouraged by management. These activities do cut into production time indirectly. The men think and plan and discuss them on company time. However, as long as the supervisors do not let them get out of hand, they will be a valuable diversion. They will serve to tie the men together into a cooperative working force, and the advantages will more than offset the time lost in these discussions.

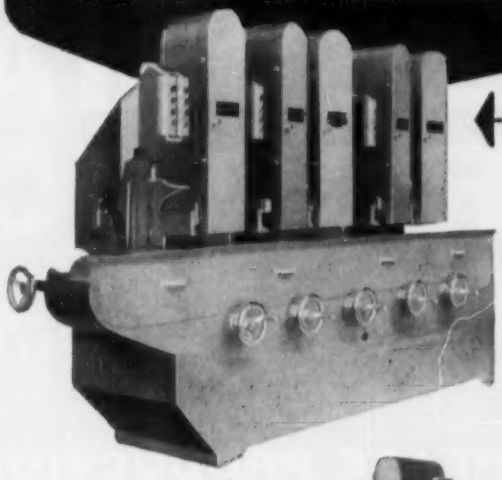
H Koslow
Bronx, NY

There are two schools of thought with regard to gambling, whether in the shop or elsewhere. One would banish it utterly as a pastime that leads inevitably to ruin and damnation; the other takes the view that life itself is a gamble and the lowly factory worker has as much right

Double Production

by grouping several operations on one

Engelberg Abrasive-Belt Grinder!



MODEL 680-5

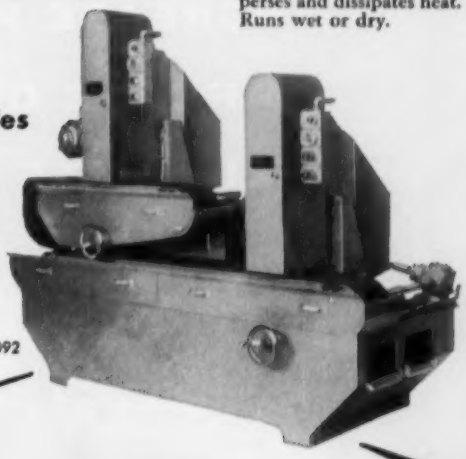
Multiple-Head Grinder Available up to 6 Heads

Single-cycle grouping on 5-headed machine above might include: deburring, flat-surfacing, sizing, polishing and fine polishing. Stock removal is at high speeds. Large grinding area, long belt disperses and dissipates heat. Runs wet or dry.

For Grinding Both Sides of Flat Work

Piece-work first passes under grinding head at left, then is carried around bend to bottom conveyor belt. Unground face is now *up*, positioned for passage under second grinding head at right.

Model 2-1092



PRODUCTION INCREASES OF 100% AND UP are not uncommon with the high-production semi-automatic abrasive-belt grinders shown here. Fine finishing to close tolerances may be done on *any* ferrous or non-ferrous metal, plastic or other material.

Precision manufacturing of these and scores of other models has provided facilities and experience ideally suited to the solution of problems in abrasive grinding. Our methods-engineers will gladly go over your drawings or samples of typical production pieces for operational analysis—no cost or obligation. Just write.

The ENGELBERG HULLER Co., Inc.
189 Seneca St., Syracuse, N. Y.

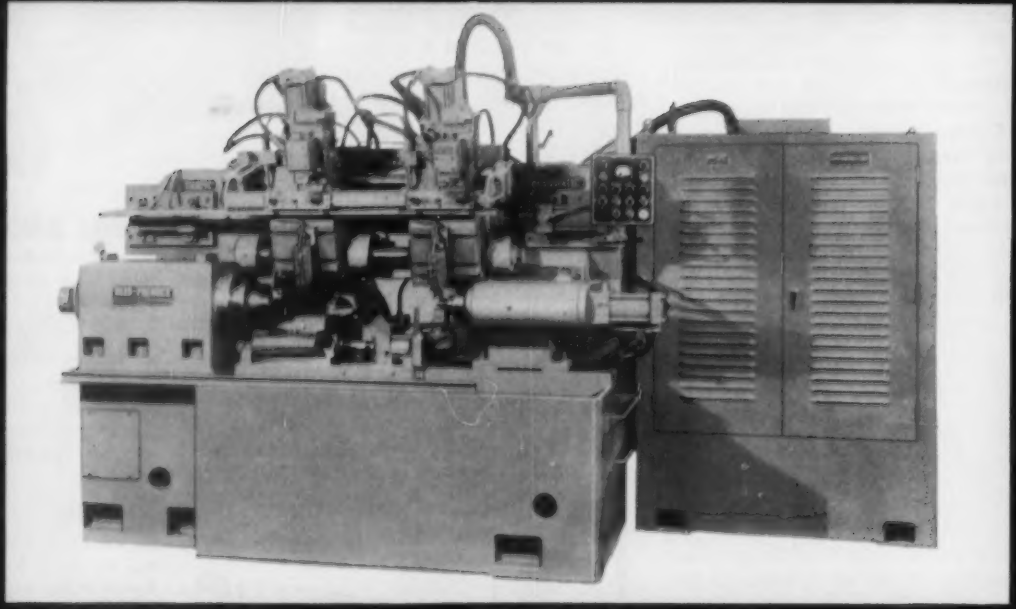
See the newest ENGELBERG Models at the METAL CONGRESS SHOW—BOOTH 2746

ENGELBERG PRECISION ABRASIVE-BELT GRINDERS

Find out how the

REEDMATIC PRODUCTION LATHE *will help you to*

- INCREASE PRODUCTION
- IMPROVE QUALITY
- ELIMINATE SECONDARY OPERATIONS



Here is the REEDMATIC Production Lathe, an entirely new and different concept in automatic lathes. It differs from the conventional because of its unique design of a rigidly constructed top support casting, on which are mounted one or more independently controlled vertical carriages. This feature, combined with dual mounting of the tail stock, leaves the entire machine front unobstructed. Many additional design features offer you numerous advantages not found in other automatic lathes.

Increased production – This rigid construction contributes maximum support to the cutting tools. In one installation, cutting speeds up to *1,600 surface feet per minute* have been found practical in machining alloy steel forgings. Tool life has also been *increased 3 to 4 times* over conventional use.

Semi-Automatic Cycles—The operator only places and removes the piece. Automatic retraction of tools to starting position removes loading interference. Top bed design speeds loading and unloading, reduces operator fatigue and tool damage. Complete automation, as well as automatic size control, can be incorporated if desired.

Chip Disposal – There is no chip interference on the REEDMATIC Production Lathe. Overhead slides and open machine front allow unobstructed chip drop, and several methods disposal may be used. Location of tool slides above work also eliminates damage from chips, dust and coolant.

Improved quality – Hydraulic feed eliminates backlash, gives positive tool traverse each revolution. Tool setting, and tool adjustment to compensate for wear, are accomplished with precision micrometer dial setting.

Tracer Control – A tracer valve controls both longitudinal and cross feed with one control and ±t 90°. Parts with several shoulders, diameters, radii and angles are being produced with *maximum tolerance variations of ± .001*. Template control of this tracer provides uniformity without operator's help. Multi-cycles and complete finish cutting of all surfaces can be done in one setting.

Eliminate Operations – Extreme dimensional accuracy and fine finish common to REEDMATIC Production Lathe output enable you to eliminate many secondary operations entirely. An auto manufacturer, for example, has been able to *do without one rough and two finish grinding operations* on one part.

Save On Materials Handling—This performance of the REEDMATIC Production Lathe will help you reduce materials handling between operations. Floor space can be freed for other use, and labor eliminated. Absence of chip disposal and increased tool life mean further savings in maintenance and down time charges.

Two Models of the REEDMATIC Production Lathe are now available. The C-30 has an 18" swing, and 12" over the cross slide ways. Model C-60 has a 24" swing, and 16" over the cross slide. Both can be arranged for chucking or between-center work.

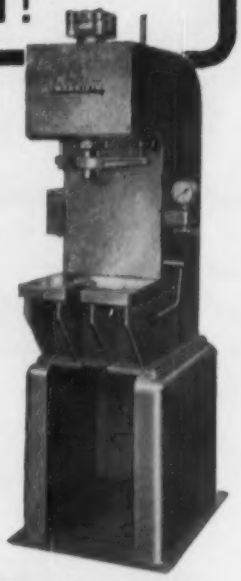
For full information contact our exclusive distributing agent, Burleigh & Stocker Machine Tool Co., Pleasant Ridge, Mich., or write to Reed-Prentice at the address below.

REED-PRENTICE

Affiliate of PACKAGE MACHINERY COMPANY

677 CAMBRIDGE STREET, WORCESTER 4, MASS.

"BEST $1306 WE EVER SPENT!"



That's the price of this 5-Ton HANNIFIN Press*

A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

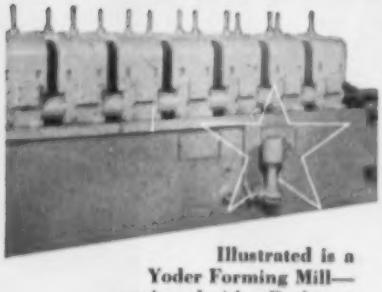
*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

Hannifin Corporation, 517 S. Wolf Road, Des Plaines, Illinois

Star Performer on METAL WORKING machinery

Ruthman Gusher Coolant Pumps



Illustrated is a Yoder Forming Mill—equipped with a Ruthman Gusher Coolant Pump.

You get instantaneous coolant flow, from trickle to full volume, the moment the machine starts, with a Gusher Coolant Pump. The electronically balanced shaft reduces wear from vibration to a minimum. The pre-lubricated ball bearings require no maintenance attention. From every angle, Ruthman Gusher Coolant Pumps are better.

THE RUTHMAN MACHINERY CO.

1818 Reading Road Cincinnati, Ohio

to invest fifty cents or a dollar in the shop pool as the top brass has to pick up the telephone and call his broker with a view to taking a flyer in International Gadgets Inc.

Both are gambling—and doing it on company time, too—which, after all, is the nub of the situation that confronts Ed and Al and their counterparts in industry for lo these many years. Ed, in their latest opus, is cast as the villain of the piece—from one point of view—resolved that gambling of even the mildest sort should be ruthlessly stamped out. Al, of course, is cast as the more likeable character and certainly no tool of the gambling interests. He takes the view that human nature being what it is, a little gambling in the shop brightens up the drab routine and can be tolerated, and controlled.

I think most foremen will agree that Al comes closer so far as a realistic approach to the situation is concerned. I can recall the time when smoking was forbidden by company edict in most shops, but most lovers of the weed managed to find a more or less secluded spot to drag on a cigarette or puff the contemplative pipe. I recall also one respected foreman who always had business that involved a visit to the blacksmith shop mid-morning and mid-afternoon. Outside the shop he was seldom seen without a well blackened briar clamped in his mouth. We also had a superintendent who was known as "The Nose" because of his habit of sniffing the breeze as he went up the shop aisles. It was rumored that he could detect the odor of a Sweet Caporal at a distance of fifty feet. The detection of cigar

"Need any help?"

New Style KSDN Kendex Tool designed for turning, profiling and chamfering in either direction

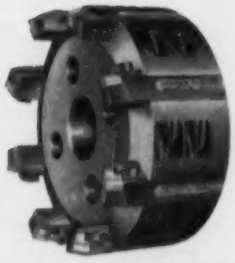
KENDEX* turnover "throw-away" principle adaptable to many special cutting jobs

Quick, accurate indexing . . . fast tool changes . . . *no* costly grinding . . . all of which add up to higher production with lower tool investment and minimum maintenance costs.

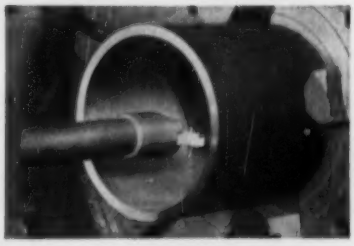
These are the Kendex advantages that have resulted in adaptation of Kendex to many *special* job applications; odd job milling, step milling, face milling, and boring, chamfering, turning, and profiling operations. A few adaptations of the Kendex design principle to varied cutting problems are illustrated.

But, no matter if it's a special or a standard machining operation, Kendex Tooling provides many distinct advantages. In addition to quick, accurate indexing, without resetting the toolholder, and the elimination of all grinding, Kennametal* "throw-away" button inserts reduce machine down time and speed up production.

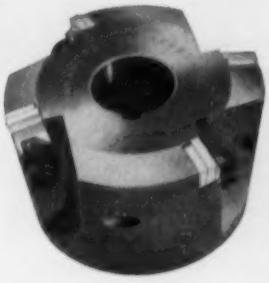
Why not let a Kennametal tool engineer help you select the right Kendex Tooling for each job . . . special or standard. By training and experience, he is qualified to analyze tooling problems and recommend right solutions. Or write KENNAMETAL INC., Latrobe, Pennsylvania.



Eight standard Kendex Tools adapted to odd job milling



Boring bar equipped with standard Kendex Tooling

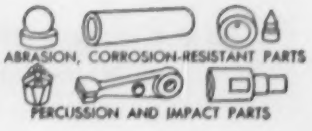


Special 4-step boring head with adaptation of standard Kendex "throw-away" inserts and clamp mechanism

A standard Kendex Tool fitted to a special bar

*Registered Trademark

INDUSTRY AND KENNAMETAL ...Partners in Progress



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DEVLIEG *Spiramatic* JIGMILS®

for ULTRA-PRECISION BORING and MILLING

THE "ACCEPTED" MACHINE FOR JIGLESS PRODUCTION OR ONE-PIECE JOBS

The DeVlieg System of "JIGLESS BORING"— ★ Eliminates expensive jigs ★ Permits complete flexibility of product design ★ Insures interchangeable assembly of parts without hand fitting.

DeVlieg JIGMILS are widely used in toolrooms and experimental shops for machining all types of jigs, fixtures and experimental parts to precise limits of accuracy with a minimum of operator skill.

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SEE A PRACTICAL DEMONSTRATION OF THE JIGMIL TECHNIQUE

DEVLIEG MACHINE COMPANY
Write for Illustrated Catalog

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DETROIT 20, MICHIGAN

odors or pipe tobacco was of course duck soup to him. (For the benefit of our English readers a Sweet Caporal in those days held the same place in cigarette favor as a Wild Woodbine did in Old England.)

However, to return to gambling. No one expects a foreman to countenance any breach of shop rules, least of all the men themselves. There are, however, "promoters" in every shop who make a nuisance of themselves by selling chances of every kind, and these individuals should be dealt with firmly and not allowed to multiply. A foreman is usually able to distinguish the promoter from the individual who runs a turkey raffle at Thanksgiving or Christmas, or the guy who is asked to run the shop pool when the World Series rolls around. Providing nothing is done to disturb shop routine, a wise foreman looks the other way when such time-honored affairs are in process.

To sum up, to every rule there is always an exception. The foreman, as a representative of management, can safely be trusted to know when a strict interpretation of the rules is required, and when the men can be allowed a little leeway.

Robert S Alexander
Glastonbury, Conn

EVERY industrial and business organization faces the problem of employee gambling. As a general thing it is more prevalent in the shop than in the office. This is probably due to the stronger feeling of comradeship and friendliness which exists in the shop. This no doubt results from the greater degree of cooperation required in the shop; there are more opportunities for people to work together on a job.

A second reason for the greater prevalence of gambling in the shop is due to the type of work and the informality. The baseball or football

(Continued on page 252)

STUPALOX

Sintered Oxide

CUTTING TOOLS

OUTPERFORM OTHER CUTTING TOOLS TWO TO TEN TIMES!

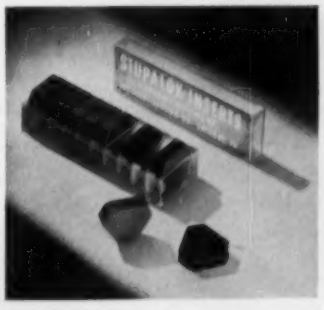
Deeper cuts, faster speeds, greater hourly production, machining the "unmachinable"—these are typical results discovered in scores of tests of STUPALOX versus other cutting tool materials.

Comparative performance studies of various tools in production shops, under normal operating conditions, brought out the relative abilities of each material. In these tests, STUPALOX outperformed other tools TWO TO TEN TIMES! In many cases, the full potentialities of STUPALOX could not be realized because of the limitations of power, or the rigidity of the machines in which the tests were performed.

As a direct result of these tests, a number of companies have already standardized on Stupalox tools, with gratifying improvements in machining costs and production.

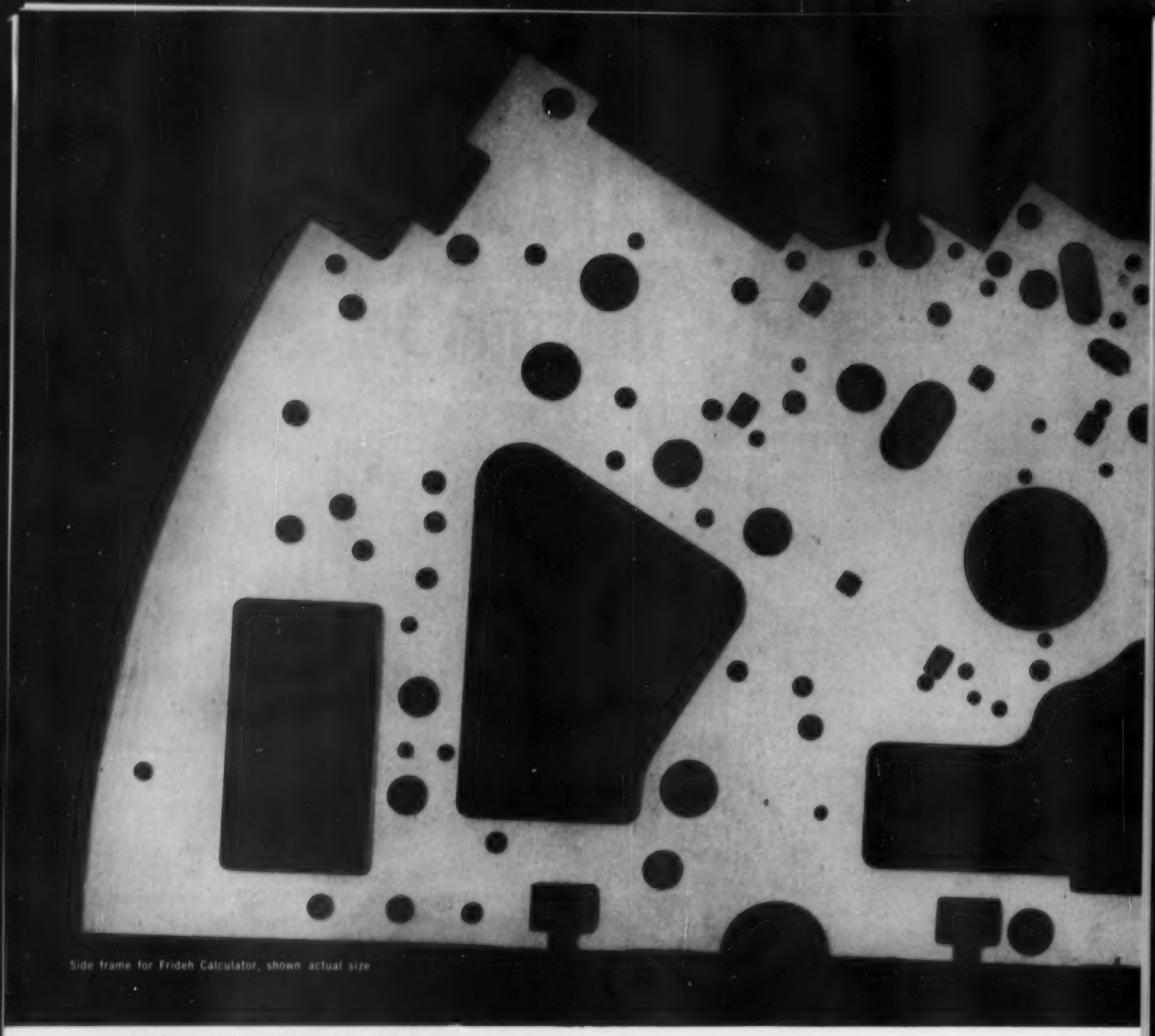
Stupalox tools are available in several styles and sizes of inserts, and in commercial quantities.

We will be glad to send you specific information on experiences with Stupalox for machining a wide variety of ferrous and non-ferrous metals.



HANDY PACKAGE...
This compact plastic box contains ten Stupalox sintered oxide tool inserts.

STUPAKOFF DIVISION OF
The CARBORUNDUM Company
WRITE DEPT. AM LATROBE, PENNSYLVANIA



Side frame for Frideh Calculator, shown actual size

At Friden Calculating Machine Co.

Only 26½ hours to locate and jig bore 98 holes in pierce die for precision stamping

***All* hole diameters held within .0001"**
***All* distances between holes held to .00015"**

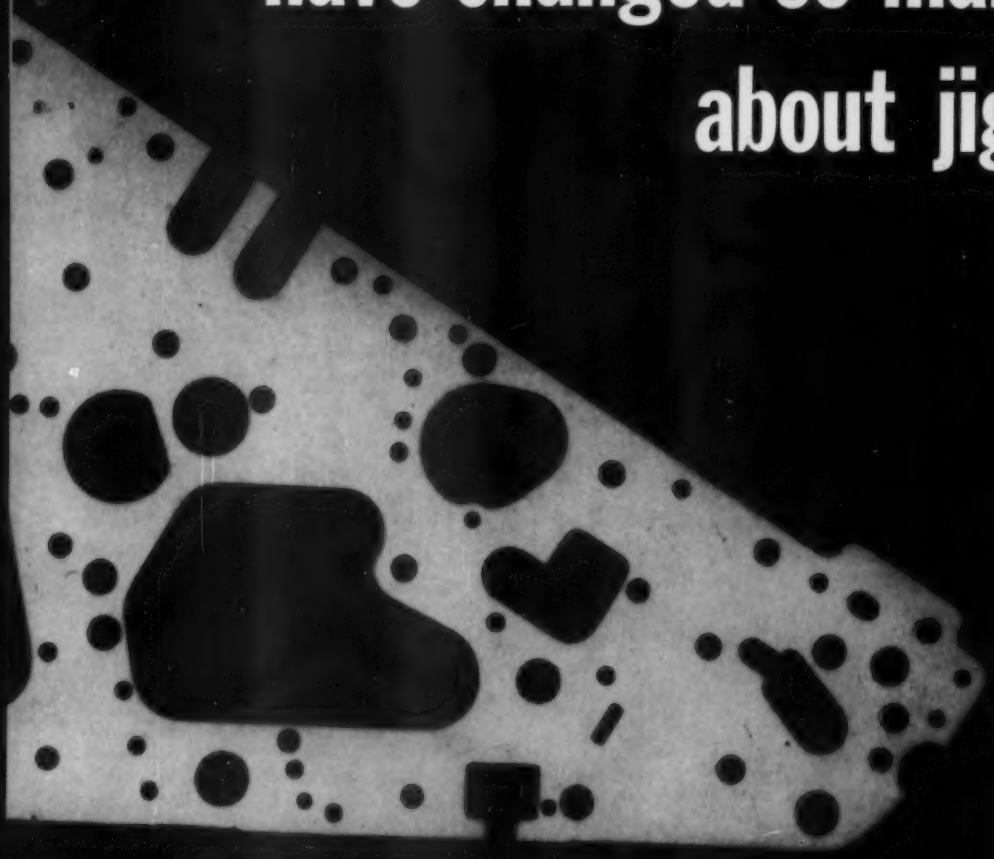
Such jig boring speed and accuracy speaks for itself—and explains why Friden now uses three Lindners, and why a growing number of important toolrooms who measure precision in extremely close limits have also installed one or more of these machines—among them companies like these:

General Electric (7); North American Aviation (5); Avco Mfg. (3); Middlestaedt (3); Curtis-Wright (3); Eclipse-Pioneer Division, Bendix (2); Vectron (2); Lockheed; General Mills...and many others.

Optical measuring system does not depend on lead screws, gage blocks, bars or limit switches—is permanently protected against mechanical wear. Only a light beam touches helically scribed cylindrical measuring scales which are independent of table movement mechanism and are *immovable* in axial direction.

AUTOPOSITIONER® enables operator to preselect table position for next hole while one boring operation is in progress—eliminates non-productive time between holes. As one hole is completed, table moves in rapid traverse to the next preselected position.

why Lindner Optical Jig Borers have changed so many ideas about jig boring



Model LB15A with AUTOPOSITIONER
Table size 44" x 24" (illustrated)
Model LB14 32" x 16"
(without AUTOPOSITIONER)

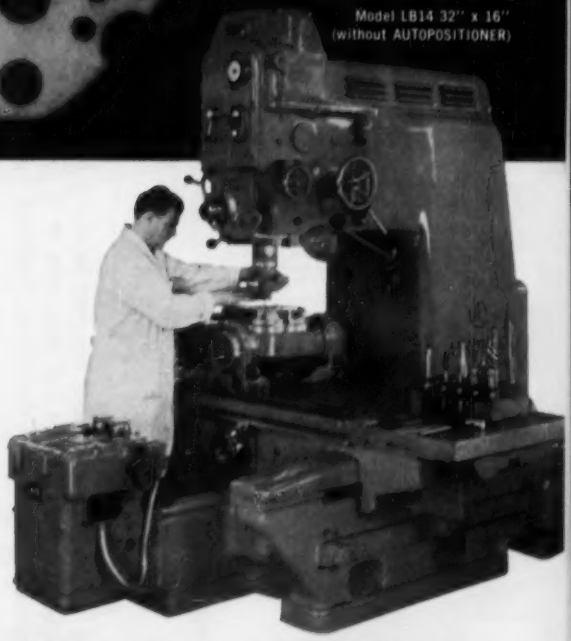


Photo-electric optical centering device minimizes visual fatigue and errors in settings – permits initial and repeat settings guaranteed accurate within .00015" and readings in .00005".

Projection screen eliminates operator eye strain and bending – helical line from measuring scale is projected on 2½" x ¾" screen which operator reads in standing position without eyepiece.

Automatic table clamping prevents errors in clamping and unclamping table between movements.

● ***Send for 25-minute movie film demonstration***

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LET'S TALK THE LATEST IN FURNACE DESIGN

Visualize six rows of stock — each row may be of a *different* size and shaped part and may move at a *different* rate of speed through the furnace. *That's real versatility!*

This is the nutshell story of a new Holcroft design. Here are more facts:

HEATING—Sealed head radiant tube burners heat the installation. Air and fuel are metered and progressively mixed as they pass through the tubes providing maximum efficiency at all rates of heating. A positive flow circulating fan assures even distribution of heat and atmosphere around the work.

MATERIAL MOVEMENT—Work trays push each other over silicon carbide rails. Ball bearing type screw pushers are used. An unusual flexible chain push in and push across saves valuable space and permits the use of smaller doors (less heat loss, less purging gas).

OTHER FEATURES—A safety-designed alligator door is air tight when closed, opens upon gas or power failure. Used with the Lo-Dew gas generator, a wide variety of processing (carbo nitriding, carburizing, clean hardening, carbon restoration, etc.) can be handled.

• • •

If you run a mixed production schedule or "all alike" parts—you'll do best to look carefully at what Holcroft can do for you. Better do it right now. Just write!

BLAZING THE HEAT TREAT TRAIL WITH HOLCROFT

HOLCROFT AND COMPANY

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PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

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CANADA: Walker Metal Products, Ltd., Windsor, Ontario

pool or the lunch-hour poker game does not seem out of place, and provides a popular diversion from the ever-present pressure of work. The gambling provides a mutually interesting topic of discussion.

This very popularity is the main reason why management should make every effort to reduce the amount of gambling in the shop and should eliminate it entirely if possible. Gambling is a wasteful, non-productive distraction which cuts into production. Where a baseball pool is operating in the shop in one of the usual forms all the games for the week are involved. As a result, everyone is interested in the progress of the game, the number of hits made, and the runs scored. A regular network for the transfer of this information is built up, from the radio in the cellar stockroom or in the maintenance department to the elevator operators and out across the floors. In some companies the interdepartment telephones are used to disseminate this information. The amount of man hours spent in obtaining this information, communicating it, and then discussing it, adds up to a significant figure. Even the employees who do not have a real interest in the sport itself become involved in the gambling. It is a diversion from the work at hand.

In order to protect themselves from this loss, management must make a firm stand in opposition to gambling. The short hours of the present work day, coupled with rest periods and coffee breaks, make it unnecessary to tolerate an uncontrolled distraction of this type. The usual excuse for the existence of activities of this type is that they are good for morale, or that the men need the diversion. This may be true to a limited degree but the answer

"Good news—Old where's this—where's that—take a letter—won't be in today."

SCENE 75:
"High Speed Operation"
...from the Geometric sound film "Facts About Self-Opening Die Heads and Collapsing Taps"
VOICE: "....Although this die head contains many separate parts, its major components are: The skeleton, which holds the chasers. The cam, which has four push buttons that snap into the chaser lug slots for chaser retention, and four protruding lugs which, when partially rotated, cause the chasers to close or open. The back part holds the die head together. The shank adapts the die head to the machine in which it is to be used....."
GREENFIELD Tap and Die Corporation
GEOMETRIC TOOL COMPANY DIVISION
NEW HAVEN 15, CONN.
This 21-minute full-color motion picture is now available for group showing.

Photo courtesy of the Norton Company, Worcester, Mass.

Variac® Motor Speed Control

for Full Torque at Any Speed

In developing their new Rokide heat-resistant coatings for jet engines and rockets, engineers of the Norton Company found they needed a motor control which would provide smooth, continuous speed control with constant-output torque . . . particularly at the very-low speeds. The effectiveness of the ceramic-spray process depends to a considerable extent on the correct rate and evenness of feed of the ceramic rod passing into the spray gun.

> Variac Motor Speed Controls were chosen for this work because: "This was the only equipment we were able to find which would permit our motors to run at very-low speeds without losing their torque. Pulsations could not be tolerated and, because the equipment would operate for long periods at a time, the equipment had to be reliable in operation."

General Radio Motor Controls are built for just this kind of service. They are widely used where stringent specifications for performance and dependability require the very best in speed-control equipment. Typical of machinery whose operation is improved by the use of the versatile Variac Motor Speed Control are: high-speed grinders and drills, tapping machines, lathes, pumps, centrifuges, lapping machines, conveyors, coil winders, and all types of process machinery.

Inexpensive and Reliable

Variac Motor Speed Controls . . . provide adjustable speed operation of d-c motors from a-c lines, combining the convenience of a-c power with the excellent starting characteristics and good regulation of d-c shunt and compound-wound motors. Fifteen models cover motor ratings from less than 1/15 hp to 1½ hp; there is a choice of compact units for installation at the control point, or of basic stripped-down models for use by the original equipment manufacturer. Prices range from $67 to $380.

WIDE SPEED RANGE: can be varied smoothly from zero to top-rated speed with full torque and no instability or jumpiness.

EXTRA QUICK START-STOP-REVERSE: under heavy load conditions.

DYNAMIC BREAKING: on all larger models above 1/15 hp.

NO ELECTRON TUBES: selenium rectifiers make for ruggedness and reliability, require no warm-up time.

TROUBLE-FREE OPERATION: rugged design for long life; built-in overload protection prevents motor burnout.

CONSTANT TORQUE: rated horsepower delivered from full speed down to the stalling point; no torque pulsations.

Write For The Variac Motor Speed Control Bulletin for complete data

Variac® MOTOR SPEED CONTROLS

GENERAL RADIO Company

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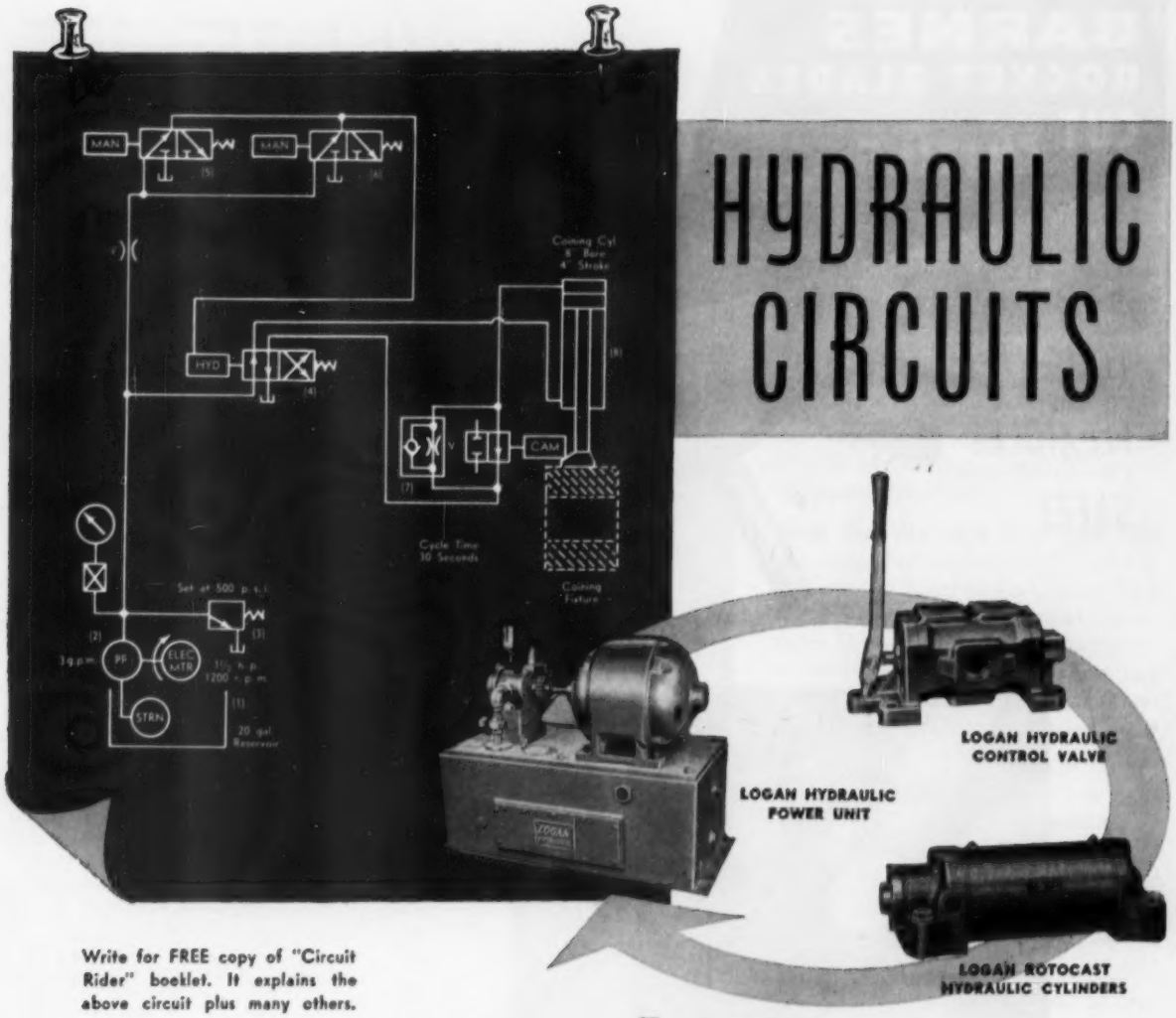
Broad Avenue at Linden, Ridgefield, N. J. **NEW YORK AREA**
1150 York Road, Abington, Pa. **PHILADELPHIA**
8055 13th St., Silver Spring, Md. **WASHINGTON, D. C.**
920 S. Michigan Ave. **CHICAGO 5**
1000 N. Seward St. **LOS ANGELES 38**

HYDRAULIC CIRCUITS



Write for FREE copy of "Circuit Rider" booklet. It explains the above circuit plus many others.

"TROUBLE-FREE" DESIGN BY . . .

EQUIPPED BY . . .

Logan

Let Logan be your ONE-SOURCE supplier of hydraulic equipment. Logan can design and equip the circuit you want. ONE-ORDER purchasing . . . ONE-MANUFACTURER responsibility . . . cuts your ordering problems. ONE SHIPMENT and ON-TIME delivery are insured through complete manufacturing control.

GET THE FACTS . . . Send this coupon for FREE Engineering Data.

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Your Dependable SINGLE-SOURCE Supplier for Air and Hydraulic Equipment

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818 CENTER AVENUE, LOGANSPORT, INDIANA

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- ☐ 100-3 AIR-DRAULIC CYLS.
- ☐ 100-4 AIR VALVES
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TOUGH!
FLEXIBLE!
SAFE!

ROCKET BLADES FEATURE *"Gradient Hardness"*

FAST—ACCURATE CUTS

Barnes Rocket Blades slice through tough alloy bar stock. Parallelism of the 2 11/16" cuts are held to within .005".

BARNES ROCKET BLADES, made of quality high speed steel, feature *Gradient Hardness. Gradient Hardness* produces hard, sharp teeth backed up by a semi-hard, tough flexible blade. The result is a one piece blade combining peak cutting ability with strength and safety. ROCKET blades will withstand sudden shock loading without breaking or shattering. You are sure of a safe, efficient blade for your toughest sawing jobs.

Call Your Barnes Industrial Distributor
for
BARNES ROCKET
POWER AND HAND
HACK SAW BLADES

WHEN CUTTING COUNTS BARNES COUNT ON BARNES

W. O. **BARNES** CO., INC.
1297 TERMINAL AVENUE DETROIT 14, MICHIGAN

is in a rest period or coffee break, and not in an undercover activity beyond the control of the supervisors and management.

This factor of monotony in industry, though of considerable importance, is probably much overstressed. It must be remembered that our ideas on the subject are apt to be largely the product of what we read. The literature on the subject tends to be colored by the feelings of those who write it. To a person with the temperament and training which go to make up a good writer the assembly-belt world seems intolerably monotonous. It is often *his* feelings he is describing rather than those of the worker. When the workers themselves present an honest picture we are apt to find a different reaction expressed.

Monotony does not reside in the job; it is in the worker. One man will hate the repeated sameness of a job and say it is monotonous. Another likes it, likes the rhythm, the freedom to day-dream, the lack of necessity to keep the attention fixed. One has emotional reaction against the work, the other has not.

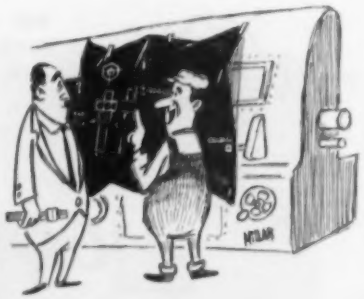
Another reason for outlawing gambling in the shop is to avoid the animosity and ill-will that results. There are always those who are poor losers as well as those who feel that they have been cheated. This results in a breakdown of the cooperative attitude which is essential to the smooth operation of the shop.

Sing Yen
Brooklyn, NY

JUST ONE BIG, HAPPY FAMILY

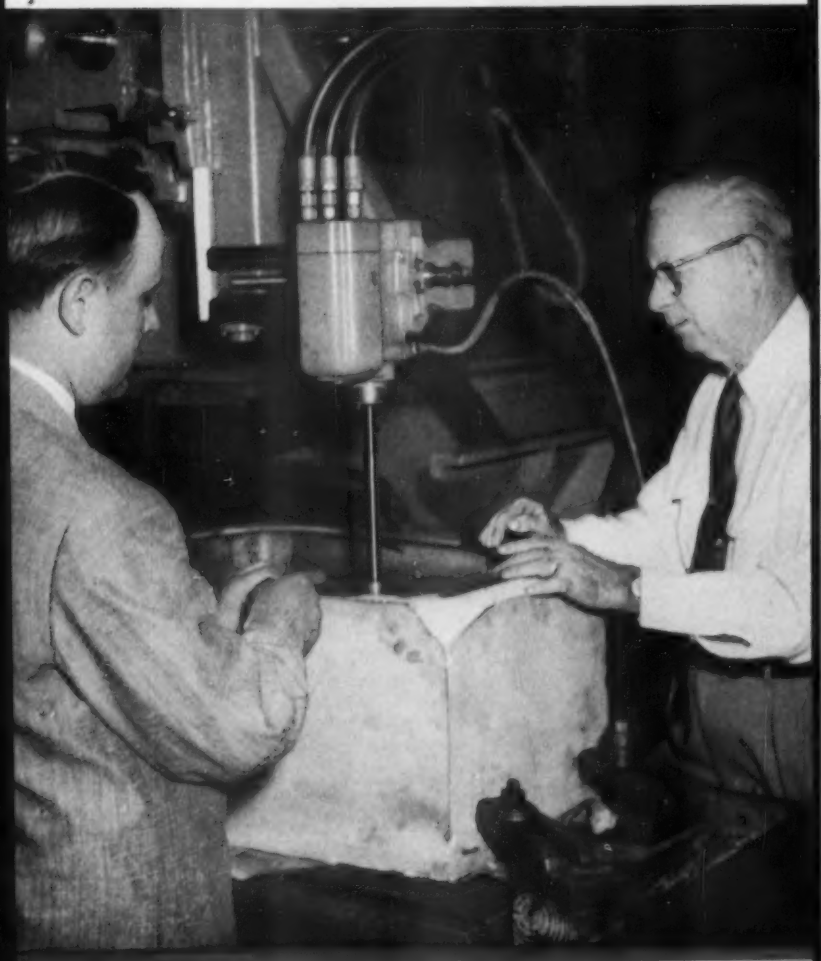
Is the foremen's meeting a legitimate place to get across "team spirit," and enthusiasm? Or should it be a forum for discussion of departmental problems? Do men need pep talks to keep them alive and awake?

A GOOD TEAM spirit is a valuable asset to any organization and is worth



"Want this on the high or low side?"

STANOIL *Industrial Oil tough performer in delicate operation*



A. T. Wallace (right), President of Wallace Tool and Die Company, and Standard Oil lubrication specialist, H. A. Peterson, check sensitivity of new Cincinnati Hydro-Tel Milling Machine which uses STANOIL as hydraulic medium. Howard Peterson has been providing technical service to customers since joining Standard Oil. He is a graduate of General Motors Institute. Howard's customers find this experience pays off for them.

Delicate operations with metal requiring almost a surgeon's skill are every day stuff to Wallace Tool and Die Company, Indianapolis. Recently, they purchased a Cincinnati Hydro-Tel Milling Machine for their highest precision work. They selected STANOIL Industrial Oil for the hydraulic medium. The reason for choosing STANOIL: they wanted a hydraulic fluid that could deliver high performance. They wanted a clean hydraulic system, free of deposits that might clog filters and interrupt operations. They wanted smooth operation without pump chatter and without foam. They got these with STANOIL.

How did Wallace Tool and Die come to choose STANOIL? The answer is not hard to find. They had used STANOIL for hydraulic systems throughout their plant for many years. It has given them the results they wanted so it was natural to pick STANOIL for their new Cincinnati machine.

With STANOIL the machine performs the delicate operation of contour tracing with only 3½ ounces of pressure needed to control the milling cutters. STANOIL gives them smooth, steady, uninterrupted performance.

STANOIL can serve you. In the Midwest a lubrication specialist at your nearby Standard Oil office will be glad to show you. Call him. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD

STANDARD OIL COMPANY (Indiana)

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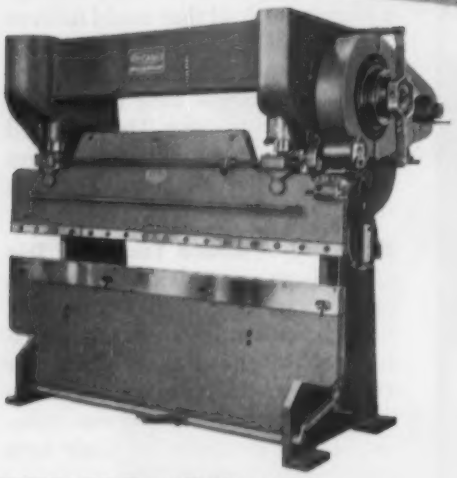
Sheet Metal Operations



- Beading
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- Corrugating
- Curling
- Drawing
- Forming
- Joggling
- Multiple Punching
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Five Models for Sheet Metal Work
11, 30, 36, 50, and 60
Ton Capacities

CHICAGO Straight-Side and Gap Presses with Large Die Area for blanking, punching, trimming, and shallow drawing. Custom built to individual requirements in stroke, die space, and bed area.

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working for. The term team spirit does not simply mean a feeling of friendliness and good fellowship; it goes much deeper than this.

Everyone in the plant is there to contribute a certain function toward the production goal. Individually they can accomplish but little. As a member of an organized team they are important and productive. There is a great difference between the output of an enthusiastic, interested employee and a lackadaisical clock watcher.

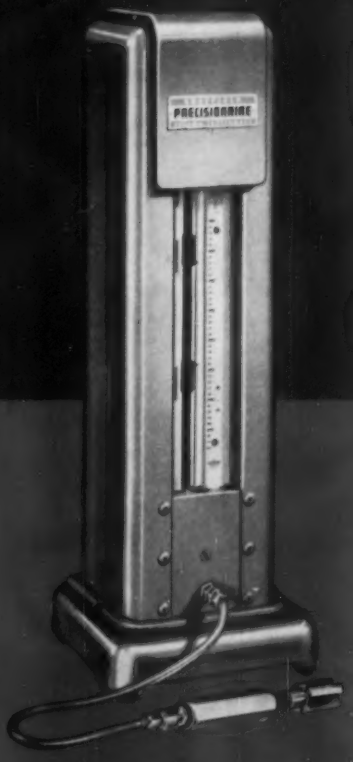
Building up a good team spirit is one of the most important and at the same time one of the most difficult functions of management. It requires a good deal of effort and ability. The man who would lead must realize that leadership is an art and not a science. There are no laws of leadership. Not all men can use the same tactics successfully, nor will all workers respond to the same treatment in the same way. One might as well try to lay down the laws for the painting of a masterpiece by the artist.

The man who would develop a strong team spirit must realize he is working with men and he must study them and know them. He must realize that whether a man's pay be a dollar a day or a dollar a minute, his chief and only absorbing interest is the same—himself. The leader should make it his business to learn a fact or two about every man working for him, a fact outside of the work he is doing in the shop or office. Every item of personal information so gained is a handle by which to lay hold of a man, whether

(Continued on page 260)

"Ye Gods, Finch! We can't afford to have those men standing around like that!"

FREE DEMONSTRATION



SHEFFIELD Adjustable AIR GAGES

for Short Runs and Emergencies

SUCH AS:

- Aircraft manufacturers, subcontractors and job shops having limited production.
- Accidental damage to a vitally needed single purpose gage.
- An unexpected engineering change involving part size.
- A short run of special parts for which no gages have been provided.
- A mistake or failure in ordering the needed single purpose gages.
- Sudden need for process gages at the production machines.

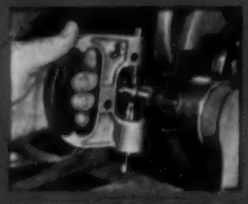
Don't let any of these situations cause costly scrap, delays or embarrassing confusion in inspection, in the shop or in the toolroom. A small investment in the adjustable air gages here illustrated is your best insurance against unpredictable production losses. ***The Sheffield Corporation, Div. #600, Dayton 1, Ohio, U.S.A.***

ADJUSTABLE BALLJET SPINDLE KITS
1" to 3"

In 5 minutes you can assemble, for precision gaging, a spindle for ANY SIZE hole from 1" to 3". No auxiliary equipment needed except conventional gage blocks—NOT EVEN ONE MASTER SETTING RING.

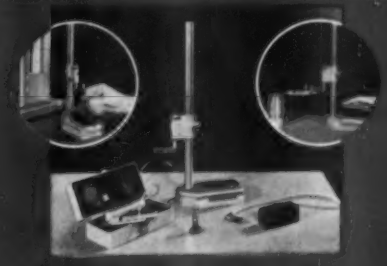
ADJUSTABLE AIREBORE GAGE KITS
3" to 12"

The Airebore Gage can be set precisely to any diameter from 3" to 12" by means of a calibrator and gage blocks. No master rings are needed.



PLUNJET ADJUSTABLE SNAP GAGES
0" to 12"

Twelve Plunjet Adjustable Snap Gages cover a gaging range from 0" to 12"—Larger sizes on special order.



AIRETEST AND PLUNJET STAND

This stand accommodates an Airetest indicator—also converts to a comparator or height gage by using a Plunjet or dial indicator and anvil.

SELF-CENTERING ADJUSTABLE SPINDLES
.500" to 3"

Four Self-centering Adjustable Spindles cover respectively the ranges of .500" to .750", .750" to .875", .875" to 1.125" and 1.125" to 3". All but the smallest can be set with gage blocks.

STANDARD ADJUSTABLE AIRSNAPS
.125" to 5.125"

Available in 17 models to cover the range .2500" to 5.500". Up to 3.000" the anvil has an adjustment of .125"—above that, .250".

GOLDEN ANNIVERSARY — MASTER CRAFTSMEN HEADQUARTERS

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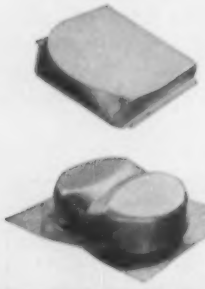
For Deep Drawn Parts ... H-P-M

H-P-M Hydraulics Prove Their Versatility At Massey-Harris-Ferguson, Inc.



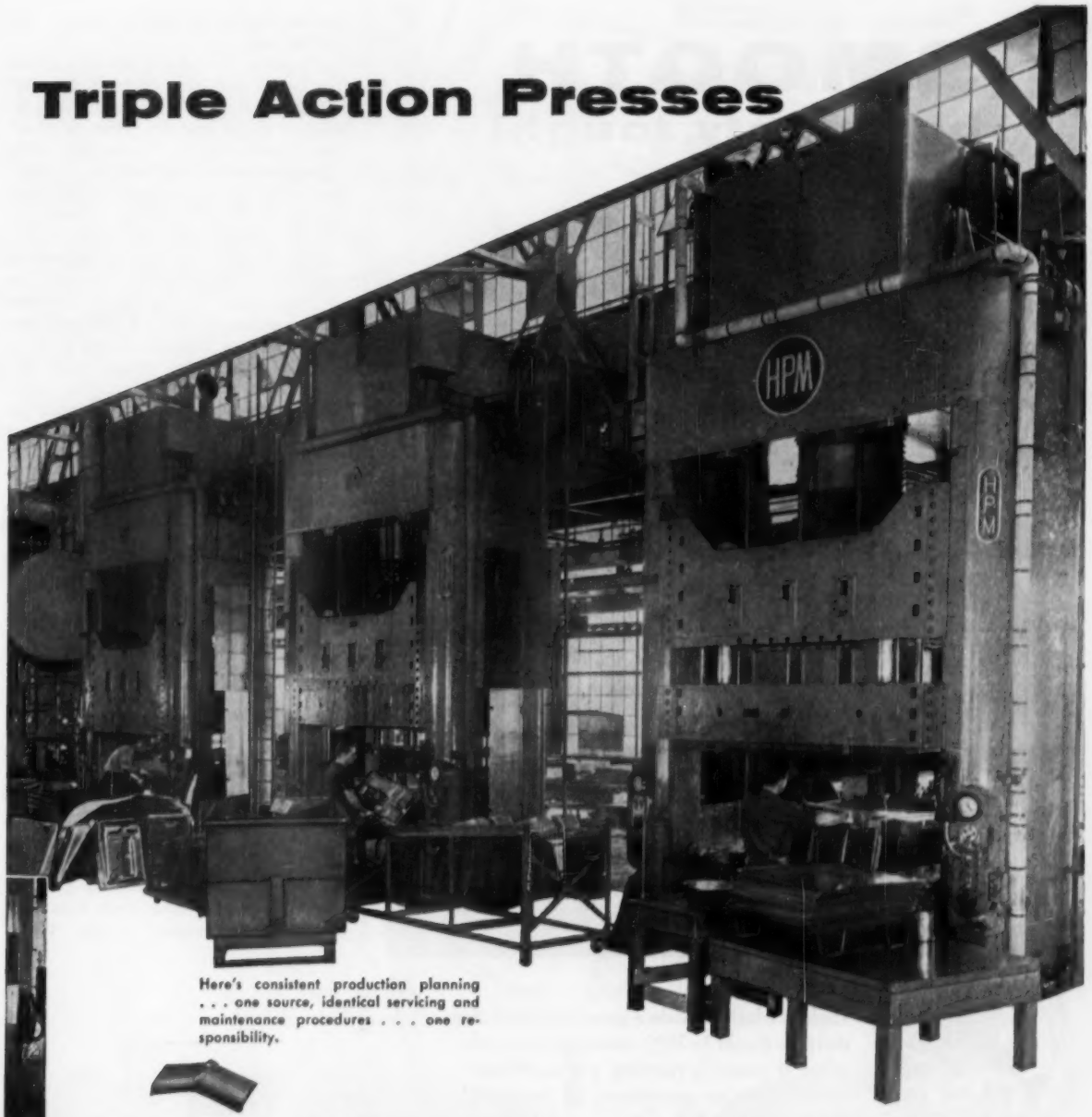
These three big H-P-M presses (the third just recently installed) are doing a "bang-up" job drawing deep, intricate parts for the famed Massey-Harris-Ferguson line of tractors and farm equipment. As a result the number of drawing operations has been greatly reduced, thus speeding up production . . . fewer dies, less press equipment, smaller factory space and less manpower have cut factory overhead. Due to their great versatility, these presses are used for all types of shallow and deep drawn parts and for short or long runs.

Two dies used simultaneously; at right, flange contour is trimmed while at left hole is punched in shallow end.

This die first forms fender brackets to desired shape and then forms flange into channel section—strong and rigid—in the same press stroke.

The fuel tank is drawn by this H-P-M. This 18 gauge part is sent to another trimming press by chute at left . . . one draw and the part is formed.

Triple Action Presses



Here's consistent production planning . . . one source, identical servicing and maintenance procedures . . . one responsibility.

Here's why H-P-M presses really pay off . . .H-P-M's fastraverse closed circuit system provides constant and controllable drawing speed . . . smooth, fast action without impact . . . independent pressure adjustments of punch, blankholder and die cushion . . . positive blankholder pressure for entire length of draw . . . shockless reversal. With H-P-Ms, you have positive overload protection . . . there's no chance of breakage . . . press reverses at predetermined position or pressure. H-P-Ms also permit quicker die set up. You, too, can eliminate the guesswork . . . choose H-P-Ms for all your metalworking needs. Write today for complete information.

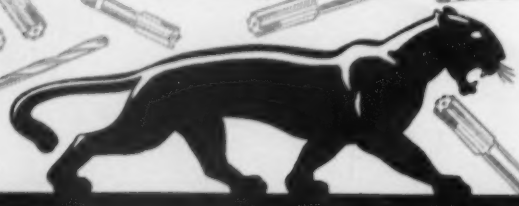
HPM

THE HYDRAULIC PRESS MFG. CO.

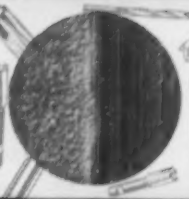
Mount Gilead, Ohio, U.S.A.

A DIVISION OF KOEHRING COMPANY

SMOOTH
but plenty tough!

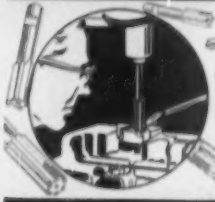


WENDT-SONIS tools cut fast and clean . . . stay sharp

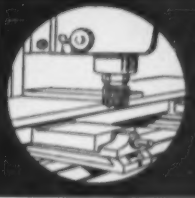


Micro-photograph, 100 diameters, shows how Flo-Finish (left) eliminates grinding marks on Wendt-Sonis tools. Actually 30% smoother — by profilometer readings — than normal ground finish (right).

With 30% smoother finish on tools, chips flow out of the flutes quickly and smoothly. On drills, for example, carbide tips are carefully blended to the contour of the flutes — tools are then given Flo-Finish after polishing.



Tools cut fast, provide a good finish and stay sharp — thanks to 30% smoother Flo-Finish. When it comes to reaming, you can't beat Wendt-Sonis on smoothness, or toughness!



30% smoother Flo-Finish is furnished on *all* Wendt-Sonis round tools at no extra cost. So Wendt-Sonis end mills too are smooth . . . and tough!

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WENDT-SONIS COMPANY

Hannibal, Missouri • Rogers, Arkansas

he be above or below us in the organization.

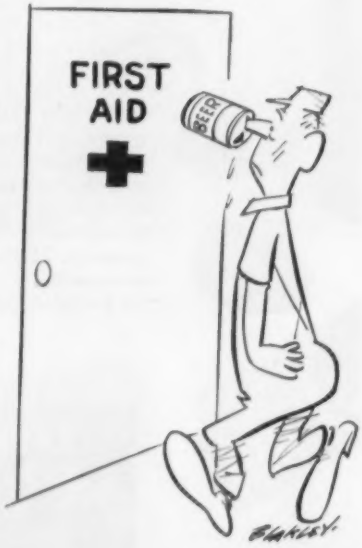
Children, birthdays, hobbies are to be noted and remembered. On occasion they are mentioned or inquired about and the man is given the opportunity to discuss them with an appreciative and interested audience. By this technique he is made to feel that he has been recognized as an individual. All any of us needs in order to be encouraged to talk about himself is a chance and a listener, and having had a listener who appears interested, we are flattered, and inclined to think well of the person who has given us the opportunity.

The team spirit in a company is important. The latest tools and methods are available to all companies; it is the seemingly little things like team spirit that make the difference and permit one company to get ahead of another.

William Martin
Brooklyn, NY

THE PROBLEM of team spirit and good fellowship is one which every industrial and business organization faces. The value of the team spirit is recognized but the question is, what is the optimum amount?

Some companies go all out in an effort to generate team spirit and organize baseball groups, picnics, parties, dances, and even company bands and company songs. When



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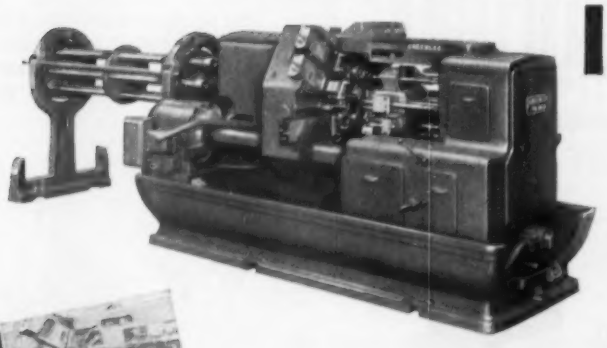

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SECOND-OPERATION
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Men would not accept either idea at first . . .

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carried to excess this policy can backfire and actually reduce production. The employees can become so imbued with the team spirit that they spend an excessive amount of company time discussing these activities and being good fellows. The company is there to earn money and, while it is true that a happy crew turns out more work, it does not necessarily follow that the generation of a strong team spirit makes for happy, contented employees. These activities are expensive to initiate and to operate and some workers might feel that the company could better spend the money in other ways to benefit a larger portion of the employees.

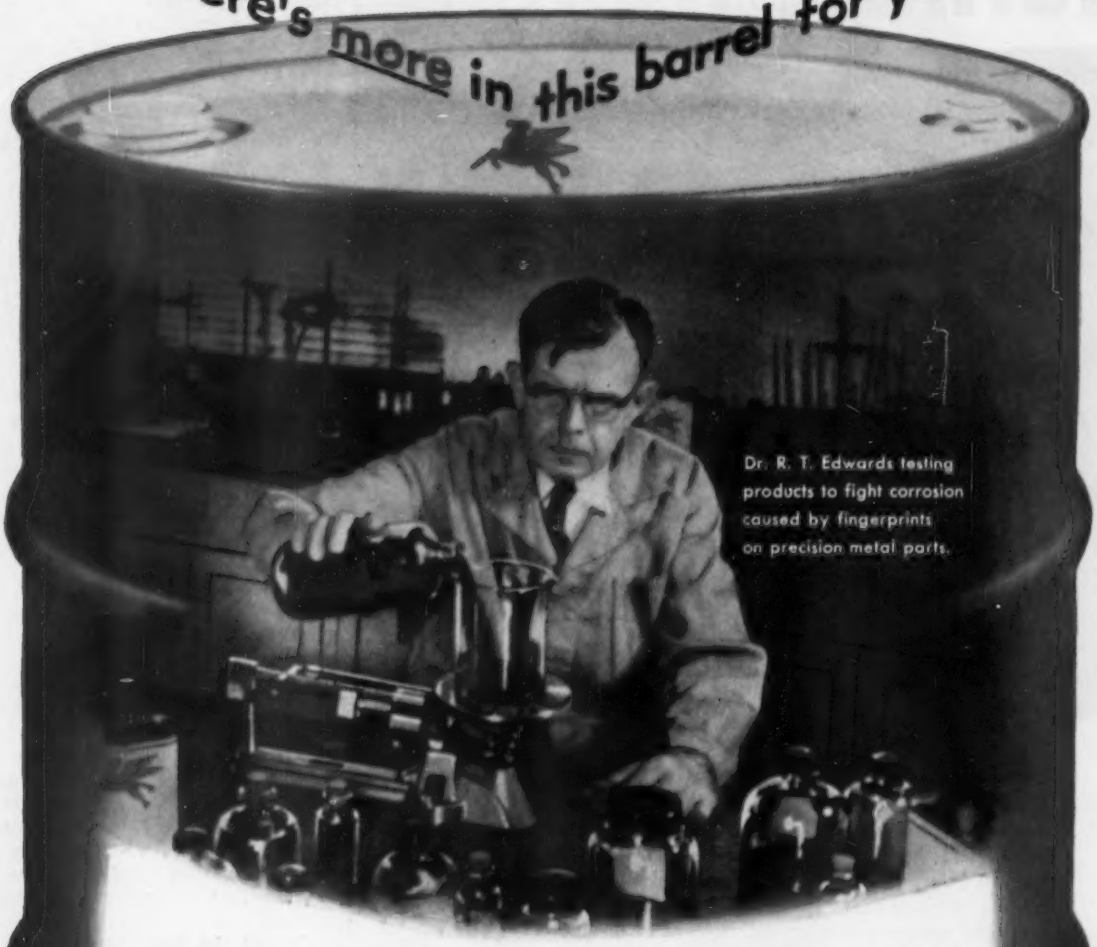
An additional problem resulting from this team spirit is an informality and friendliness which can have a deleterious effect. When it becomes necessary to fire an employee, or when a lay-off occurs, it is a harder blow for the employees to take. They grow to feel that they are good friends and buddies with the supervisors, and it is difficult for them to conceive of the possibility of being discharged.

There are other serious consequences which result from the development of this attitude in the plant. This spirit of cooperation can extend beyond the sphere of the company activities and can prove to be of great help to those employees who have "government jobs" to be made up with company materials and on company time.

What is the answer? As with most every thing in this life moderation is essential. The team spirit is a good thing but it is possible to have too much of it. These excesses result from a misinterpretation by management of the employees' attitude. The employees are there because it is an opportunity to earn a living. Carefully guided programs can improve the attitude of the em-

". . . And then, of course, when I'm Vice-President in Charge of Engineering, I'll see to it that loafers like you are summarily dismissed."

There's more in this barrel for you...



Dr. R. T. Edwards testing products to fight corrosion caused by fingerprints on precision metal parts.

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Have you fully investigated the cost-saving advantages of furnace treated cold finished steels? For a number of years WYCKOFF has been saving time and money for industry's leading buyers through highly specialized pre-treatment of steel to produce exact and unvarying working characteristics.

One of our metallurgists will be glad to discuss this service as applied to your production requirements.

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ployees so they have a better feeling toward the company. However the employer is dead wrong if he initiates a program with the intention and hope of getting the employees to "love" the company. They just cannot develop that much interest in the company.

In general, a little team spirit goes a long way and it is better to err on the side of too little than on the side of too much.

Sing Yen
Brooklyn, NY

INSTALLMENT BLUES

Is a raise in pay, or a promotion, the answer for the man who has gone over his head in debt? Won't he be just as liable to incur further debts with a little more money in his pocket?

At one time it would have been asking a lot of a British or other European working man to live within his pay, particularly semi-skilled or unskilled men. Millions, however, did live within their scanty income and, incredibly, continued to put a little aside for the inevitable rainy day. This was achieved at the expense of living standards, sometimes at the expense of the family's education and future prospects in life. No sensible person would wish to see such actual poverty and shabbiness return.

Today the pendulum has swung heavily in the opposite direction, and I feel the remedy is little better

"Yes Sir, this was one of the first machine shops built in the United States . . . It still has its original timbers . . . Sir, OH Sir!"

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GROUND FROM THE SOLID

an engineer wants to know

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TO: Purchasing
FROM: Production Engineering

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With a little outside help, I think we could ream and bore those castings in one operation—with gun drills.
Would you get a Chicago—Latrobe engineer in for consultation? I hear they are best in that field. E.T.

Much is new with gun drills. They are being used today on a variety of applications unheard of a short while ago. So much has happened—so fast—that it has been difficult for many of the most expert technicians to keep fully informed. A good place to get sound advice on the use of gun drills in any plant is from a Chicago-Latrobe service-engineer. They are pioneers both in production of finer tools and in development of techniques for their use. Call C-L soon . . . without obligation, of course.

Chicago-Latrobe

CARBIDE TIPPED GUN DRILLS

DOUBLE CIRCLE TOOLS

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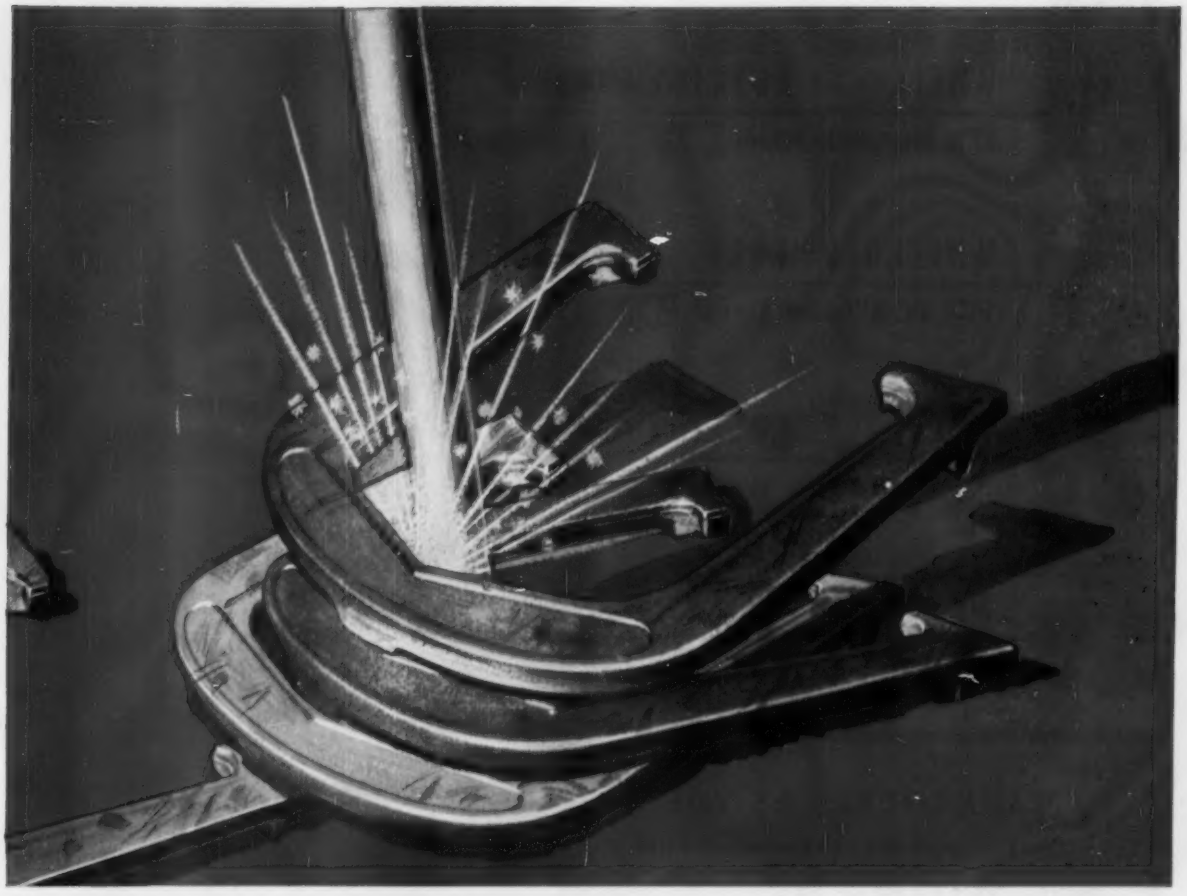
than the earlier disease in some respects. It is quite clear that the average man and woman must learn to practice a high degree of self denial. Those who have a flair for making money can afford to spend freely, and none can blame them. No one should grudge them their affluence so long as they pay their way and don't expect others to fork out for their extravagances.

The less talented folk in the matter of making money, the folk who are compelled or content to hire their labor to others, must school themselves to be satisfied with what their labor will fetch in the open market and frame their family budget accordingly. There should be a column in that budget for possible adversity.

A man's domestic affairs have, or should have, nothing whatever to do with his rate of pay, or his status in the company. Usually his rate of pay will conform to the rate prevailing in his particular district, and his status should conform to the value of his services to the company. To promote a man in order that he may clear off debts foolishly contracted would be mismanagement of a high order, and would be no encouragement to thrift.

The improvident recipient would thus be encouraged to stage another bout of anticipatory spending in the hope of further consideration. If such insanity became company policy, the shops would become a hotbed of profligacy, with progress and efficiency crying in the wilderness. The most reckless spender would ultimately by "default promotion"

"But the trouble with doing nothing is you can't stop and rest."



"Finish first in your league"
...with J&L COLD FINISHED JALCASE STEELS

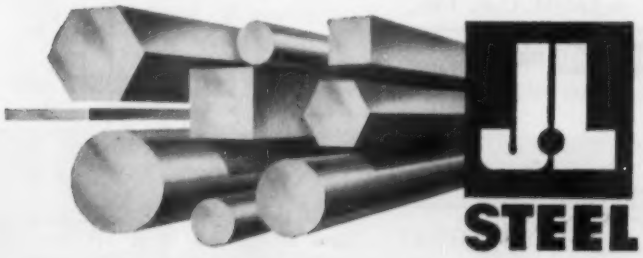
Cold Finished Jalcase—now available in 10 SAE and AISI grades—is the original free-cutting open hearth steel having the mechanical properties required for special service machined parts. And it's especially suitable for heat treating. This grade is one of a complete line of premium quality, free-machining bar steels developed over the years by J&L specialists. Thus, we can recommend the right type to help solve your particular problems.

Fundamental advantages of Jalcase are:

- Easy, consistent machinability
- Minimum distortion
- Fast, uniform response to heat treatment
- High wear resistance
- Improved cold-drawn mechanical properties

Adequate stocks are available in important industrial centers. Phone the nearest J&L District Office or your Distributor today for prompt and efficient service.

Pick the Free-Machining Steel that serves you best—from J&L's complete Cold Finished Line



Jones & Laughlin
STEEL CORPORATION · PITTSBURGH

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You'll get quick action on your order for alloy steel bars, billets or forgings . . . no matter what size, shape or heat treatment you require . . . when you call any one of our seven warehouses.

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Fill your current needs by ordering our own HY-TEN steels, the "standard steels of tomorrow", or standard AISI or SAE grades.

Or write today to our Cambridge office for your *free* Wheelock, Lovejoy Data Sheets. They contain complete technical information on grades, applications, physical properties, tests, heat treating, etc.

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HOME OFFICE:
WHEELOCK, LOVEJOY & COMPANY, INC.
137 Sidney Street, Cambridge 39 Massachusetts

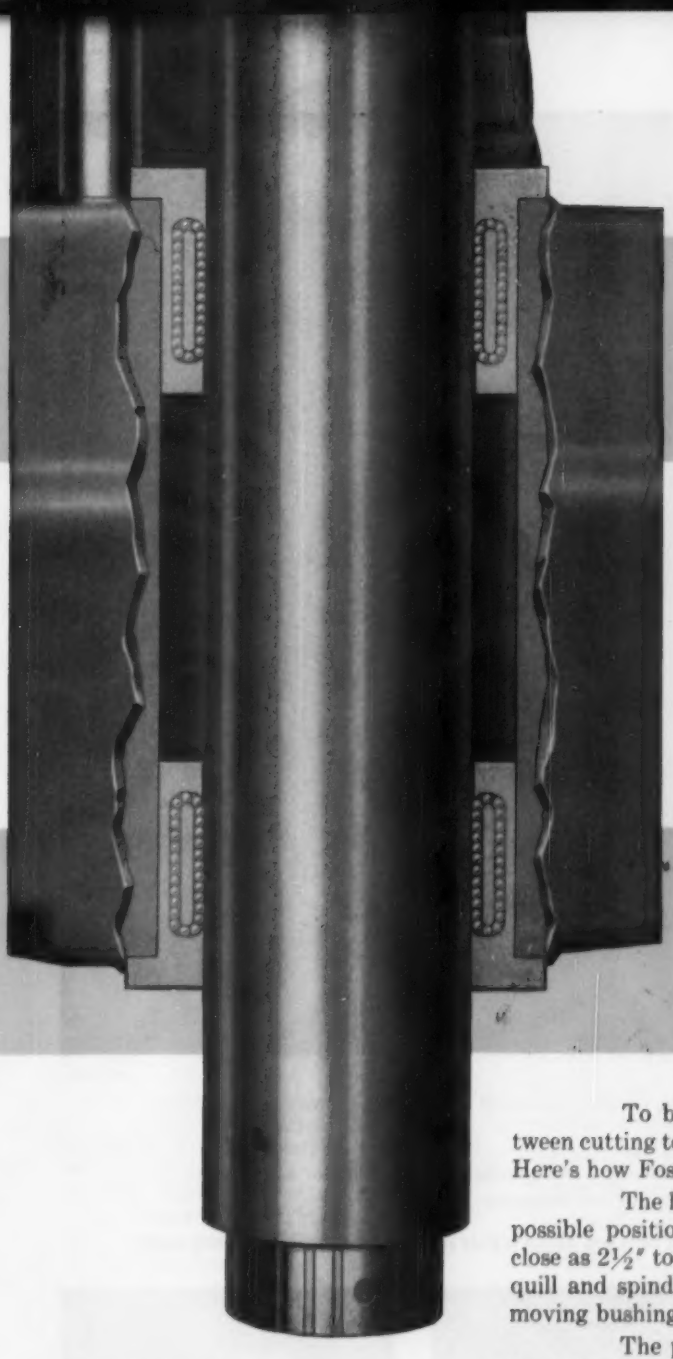
become president of the company. To promote a man who, Ed fears, is not good enough for advancement, in order that he may get—not earn—extra money to discharge a debt foolishly contracted (only, in all probability, to as foolishly contract others) would be too bad to be true. Gilbert and Sullivan never did anything half so good as that.

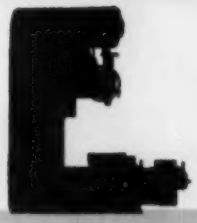
Ed's man is definitely going about his debt problem in the wrong way. He has probably been building castles in the air and forgetting about the foundations. If Ed wants to befriend him he should try a little moral suasion, and perhaps induce him to come to terms with his debtors, and keep the terms at all costs. For the company to hand out largesse is no solution. The man must help himself, and Ed should try to lead him along that path, and inject some self-respect into him. After all, the joy of overspending is like drinking champagne, or wearing high heels. If indulged in, it must be suffered for.

I don't know that I would go so far as to agree that Al is right in expecting everyone to resist all temptations. That is a very tall order; high authority assures us that only one Man attained to that state of perfection and even He had detractors.

Unfortunately, everyone is so different in outlook and aspiration. No two people see a picture or a dictum in the same light. One man may be punctilious about his commitments and pride himself that he can look the whole world in the face, while

"—All right, all right, so you're the best flycaster in the shop! Now, will you mind practising after working hours?"





NEW QUILL BEARING DESIGN helps achieve extreme precision in Fosmatic Jig Borer

To bore with precision as close as ±.0001", distance between cutting tool and lower quill bearing must be held to a minimum. Here's how Fosdick minimizes this crucial distance.

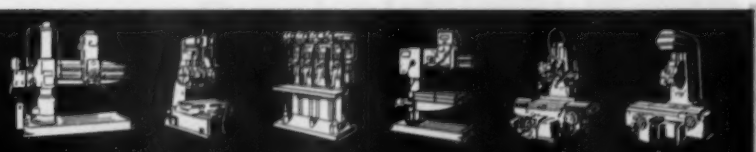
The lower quill bearing is *permanently* located at the lowest possible position in the head, permits boring with spindle nose as close as 2½" to the bearing. Bearing does not ride up and down with quill and spindle as in conventional designs where balls are held in moving bushings.

The permanent location of quill bearings is made possible by unique Fosdick design—vertical ball races with preloaded precision balls circulating continuously. This design also permits spindle and quill to be shorter; thus stronger and more rigid. Both are perfect cylinders with no cuts on the outside.

Engineering advancements like this make the Fosmatic Jig Borer the most rigid and precise boring machine you can buy. Write today for the new catalog.

Eight models available from the low-cost Model 30 with 36" x 18" table, to the virtually automatic model 54P with 54" x 22" table. Other important features: Automatic Positioning, choice of two precision measuring systems, milling feed, rapid traverse to quill, power clamping of table and saddle, coolant system and reversing motor control for tapping.

NEED JIG BORING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!



Fosmatic Radial Drills | Jig Borers | Sensitive and Upright Drills | Sensitive Radial Drills | Jig Grinders | Automatic Positioning Jig Borers

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK

Do the **BIG** jobs . . .
and the small ones too
on a **BRYANT**

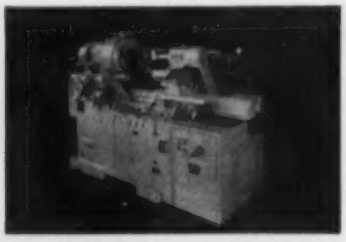
MODEL 1460 Hydraulically operated. Chuck swing of 60", total wheelside stroke of 21"; maximum grinding stroke of 16".

No matter what your internal grinding problem may be, it can be solved effectively with a Bryant Internal Grinder.

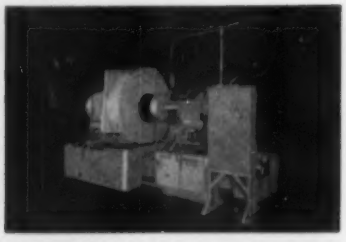
Bryant's great variety of manual, semi-automatic and automatic grinders is your assurance of a machine that is tailored to meet your production requirements.

Investigate how Bryant's engineering services can help you attain higher production at lower operating costs.

MODEL 1109 A precision internal grinder, suitable for covering the range of smaller bore sizes. Total swing of 9"; maximum grinding stroke of 3½".



MODEL 1116 Tops for both toolroom and general production work. Total chuck swing 16"; maximum grinding stroke 8".



MODEL 1480 Total chuck swing of 80". Spindle has a 9" bore so work can be extended back if necessary.

BRYANT Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT

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Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers • Special Machinery

another may persistently evade his responsibilities and look into the gutter when he meets a creditor. What one gets out of life largely depends on what one sees in life.

"Two men looked out through prison bars,
One saw mud, the other stars."

C Donald
Lanarkshire, Scotland

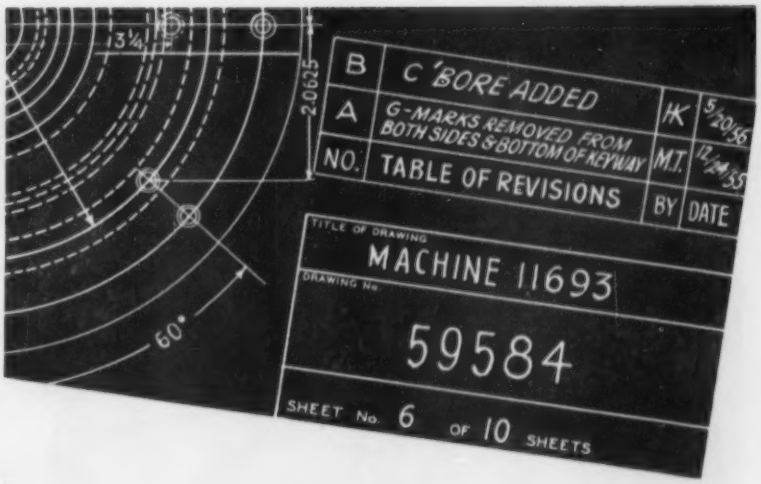
Prosperity is a wonderful thing—for some people. For others it means trouble, the kind of trouble they get into by buying more than they can pay for.

Easy credit these past years has led a lot of people down that rough road, and the result is unprecedented prosperity for that small group of businesses which make a specialty of collecting bad debts.

It's not much wonder, either, when some people are unable to resist high pressure salesmen, or bargains, or both. An installment buyer I know is committed to monthly payments of $211 a month and has a total income of $50 a week. Either he'll go hungry or one of the prospering bill-collecting firms will be on his trail.

Probably the most famous financial counsel in all English literature was offered a hundred years ago by Charles Dickens' character, the bankrupt Micawber, to the hero David Copperfield. He said: "This is my advice. Annual income twenty pounds, annual expenditure nineteen-ninety-six, result happiness. Annual income twenty pounds annual expenditure twenty-ought-six, result misery. The blossom is blighted, the leaf is withered

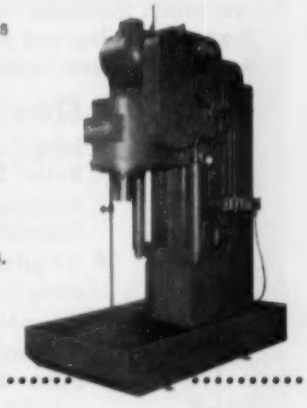
"I'm sorry to hear that you and your wife can't live on your present salary, Primrose. But I'm not going to let you down, my boy—I'm gonna give you the name of the best divorce lawyer in the business."



AUTOMATION

even though you don't have rigid stability of design

Here's automation that can be easily retooled for changes. For Baker Basics are *standard* machines that don't have to be "rebuilt" when you change your product or production methods. What's more, they cost much less than a machine specially designed for only one part. Accordingly, they pay for themselves even on lower production runs. Yet you still get *full* automation with loading and unloading devices and conveyors . . . which we can furnish as well as tooling. Use singly or in battery as a transfer machine . . . for drilling, boring, tapping, facing and other machining operations.



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AUTOMATION
Best in the long run
Practical in the short run

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Please give me the full story on automating with Baker Basics.

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BUILT to turn out PROFITS

Sheldon Lathes are designed and built to do accurate lathe work rapidly and profitably. Moderate in price they have the collet, swing and power capacity to do most toolroom work.

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$1615.00
BASE PRICE
F.O.B. CHICAGO

Design Features:

- **Large and wide "Zero Precision" Tapered Roller Spindle Bearings**—permit operation at all speeds, retain accuracy, end expensive bearing maintenance costs.
- **54-pitch Gear Box**—gives both standard and many hard to get thread ratios.
- **Large Micrometer Dials**—Make accurate operation easier.
- **Extra Collet Capacity**—1⅜" hole through spindles available on 10", 11" and 13" swing lathes.
- **More Power to Spindle**—Efficient drives with bigger **motors** and **double neoprene** V-belts to spindle.

OPTIONAL FEATURES AT EXTRA COST include: Hardened ways, Long Tapered Key Drive Spindles, 4" D1 Camlock Spindles, bed turrets, collet attachments, and other production and toolroom accessories. Lathes available with a choice of "Bench," "Cabinet" or "Pedestal" mountings.

Write for New Catalog G-55

SHELDON MACHINE CO., INC.

4231 N. KNOX AVE. • CHICAGO 41, ILLINOIS

—in short you are forever floored. As I am!" As advice it is just as good in 1955 as it was in 1849, and a sound counsel to follow. It is unfortunate that too many individuals follow Micawber's practice, not his advice. Ahead of them, if they continue this irresponsible policy, is Micawber's dire predicament.

There is no sane reason why a working man cannot be expected to live within his pay. Of course there's a lot of temptation to buy TV sets, washers, and the like with the easy credit prevailing. But that doesn't mean that a smart man can't resist it. It shows bad judgment when a man keeps on going over his head financially. If he followed the practice of saving first, and spending when he had it, he wouldn't have to live the life of a profligate bankrupt. "Money is a good servant, but a bad master." The man who sings the sad song of "Installment Blues" has not learned how to make money serve him, nor the value of it. Ben Franklin knew what he was talking about when he said "If you would know the value of money, go and try to borrow some."

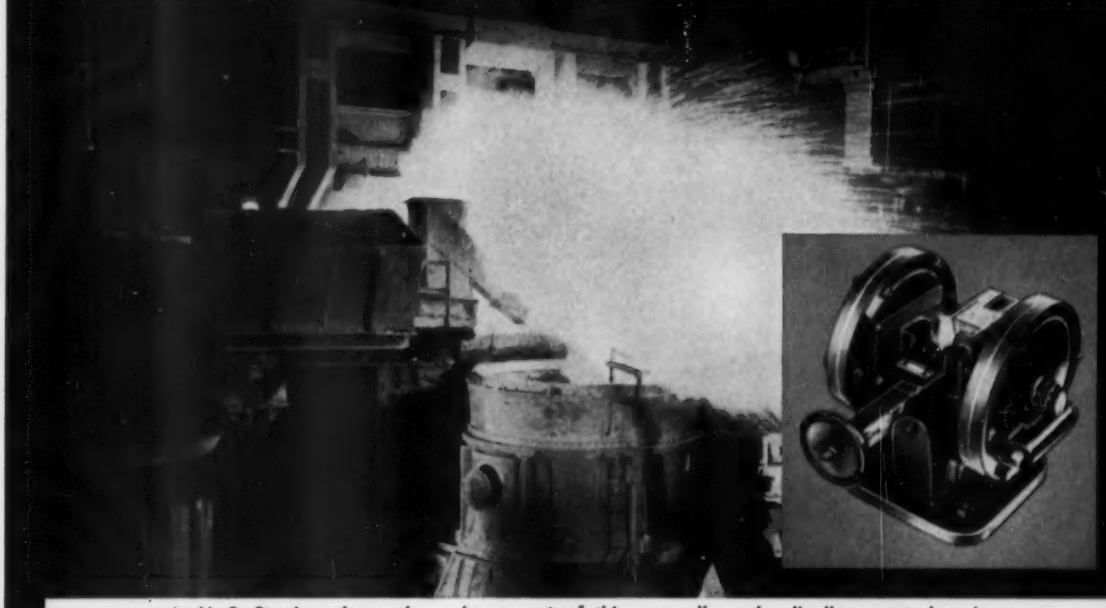
Many people still keep plunging heavily into debt to get the things they want. Too many, the experts say, are overextended as a result of buying autos, homes, furniture, and appliances on credit. American families are paying out about 12% of their incomes after taxes just to meet payments on past purchases of goods. The idea that things will keep on getting better and better seems to be the by-word for many people. There is no caution about tomorrow. "Going into hock" seems to be a national pastime.

I know of a case of a $90-a-week

(Continued on page 276)

"Whatta' ya mean, 'go 'way'? You bothered me all morning when I tried to eat!"

LEADERS IN INDUSTRIAL SAFETY: U. S. STEEL



At U. S. Steel, a thorough going safety program is *vital* to efficient production. As a part of this over-all program, fire-resistant Pydraul is used for hydraulically operated equipment located in potential danger areas.

A Tested Combination: Pydraul Hydraulic Fluid in Askania Regulators

Where it's a matter of hydraulic control of pressure, flow and ratio at U. S. Steel, you'll often find dependable Askania Regulators on the job—in blast furnaces, coke ovens, open hearths and soaking pits. Near these intense heat sources, U. S. Steel uses Pydraul to operate this and other hydraulic equipment. Here's why:

Pydraul is fire resistant . . . the only fire-resistant hydraulic fluid listed with Underwriters' Laboratories.

Pydraul gives you more than safety. You can be sure of long equipment life with low maintenance . . . because Pydraul lubricates like a premium petroleum oil. You'll save money on fluid consumption, too! Pydraul is reclaimable—you can return spillage to the system, use it again and again.

If you have any hydraulic equipment that must operate near hot metal, electrical contacts, open flame or other heat sources, you might be taking a needless risk. Your Monsanto representative will show you how easy and economical it is to convert to a fire-safe Pydraul system.

Write for a Pydraul F-9 booklet. Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Dept. PYD-4, St. Louis 1, Mo.

Pydraul F-9—first and only hydraulic fluid listed by Underwriters' Laboratories.

"In respect to fire hazard, Pydraul F-9 is rated by Underwriters' Laboratories, Inc., 2 to 3 in a class much less flammable than paraffin (petroleum) oil, according to a schedule in which Ether is rated 100; Gasoline 90—100; Alcohol (ethyl) 60—70; Kerosene 30—40; Paraffin Oil, 10—20." *Pydraul: Reg. U. S. Pat. Off.*

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WHERE CREATIVE CHEMISTRY WORKS WONDERS FOR YOU

HARTFORD
Special
OFFERS
better products
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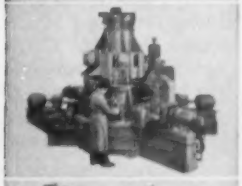
thru better methods

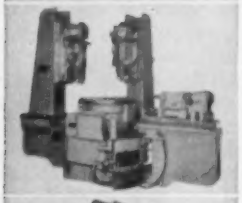
ONE SOURCE FOR BOTH

Automatic Production Machines

Double End Trunnion Type Machine



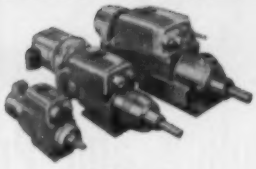
Center Column Indexing Type Machine



Universal Drilling Machine for jet aircraft components

Vertical Single Unit Multiple Spindle Indexing Machine

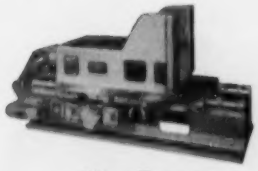
Standard Machine Components



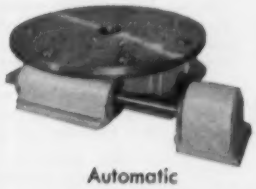
Quill Type Air Hydraulic Drill Units

Quill Type Cam Units

Quill Type Lead Screw Tapping Units



Way Type Hydraulic Feed Units



Automatic Index Tables Horizontal and Vertical

Machine Bases

Designing and building automatic production machines like those illustrated are a "Hartford" specialty. Years of experience have proven that dependable high production and economy can best be brought to the user by means of standard machine components.

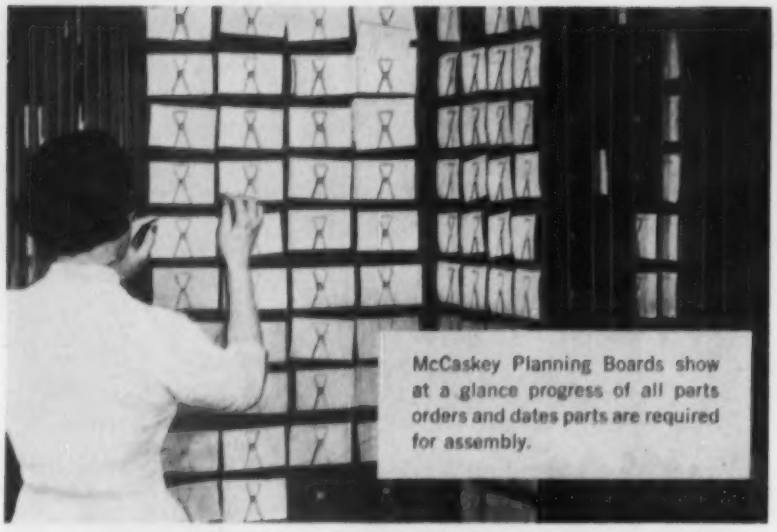
Now Hartford Special offers these production tested components to users for machines of their own construction.

Consult Hartford engineers for either—completely tooled machines or components.

HARTFORD Special

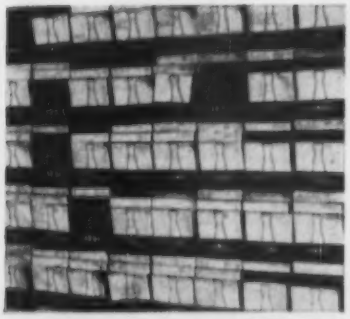
MACHINE TOOL DIVISION
THE HARTFORD SPECIAL MACHINERY CO.
28210 HOMESTEAD AVE., HARTFORD 12, CONN.

Hartford also makes automatic Thread Rolling Machines, Special Machinery and the world famous Super-Spacer.



McCaskey Scheduling and Production Control Pay Off For "Payloader"

Single form system saves costly man-hours and eliminates delays for The Frank G. Hough Co.



McCaskey machine loading and assignment boards schedule parts orders for machines and subassemblies.

McCaskey Planning Boards and Machine Control Boards—with *multiple copies of a single form*—prove effective for The Frank G. Hough Co. of Libertyville, Ill. during its present period of rapid expansion and increased employment.

Here are just a few of the ways McCaskey Scheduling and Production Control pay off for "Payloader"—how they can pay off for you:

(1.) Provide visible records of all jobs or parts orders and necessary completion dates.

(2.) Progress of parts orders is seen at a glance.

(3.) You can quickly review the status of every job in the plant and locate those that might upset schedule.

(4.) No delays because—Machine loading and scheduling of subassemblies proceed as specified by the production control department.

McCASKEY INDUSTRIAL CONTROLS
Production • Inventory • Tools • Maintenance • Costs
Division of
VICTOR ADDING MACHINE CO.
3900 N. ROCKWELL STREET • CHICAGO 18, ILLINOIS

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Please send me complete facts on: McCaskey Machine Loading and Production Control System.

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Position_____

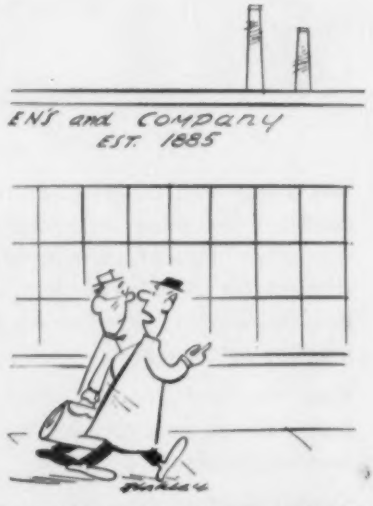
Company_____

Address_____

AM 10-56

man (with a wife and two children) thoroughly messed up with $4075 of debt to 17 creditors, including four banks, three finance companies, a savings and loan association, two department stores, a mail-order house, and two furniture stores. Collectors so pestered him at his place of business he feared he'd lose his job. He appealed to a credit clearing house to take over. His wife will go to work, and he hopes to pay off in five years. You can understand how a man, a frail human being, gets into such a mess. It stems from the quota—the goad system—and too-easy credit. The manufacturer of automobiles, of TV sets, of refrigerators, sets a total sales quota. Then quotas are set for distributors, who, in turn, set quotas for dealers, whose salesmen go out and sell. And the mixed blessings of over-liberal installment credit helps them to make their quotas. That's where the abuse is—in installment selling. It's no longer installment buying. There's no caution against the growth in debt. There's a boom in debt. Sure, present prosperity has vitality, wages are rising. Personal income is up 5% in the last year. But the monthly rate of new installment credit has gone up 33%. Monthly repayment of installment debt has gone up 10%. The rise in incomes is being anticipated, promised away.

In the case under discussion of the worker with his tale of financial woes, the foreman should take into consideration that he is likely to lose a good man if he offers no help to



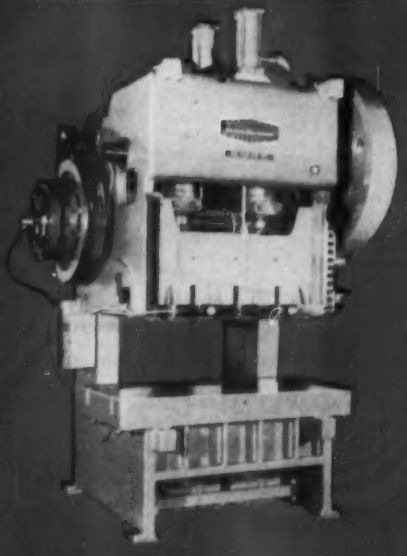
"I wouldn't mention automation to the Old Man; he hasn't completely accepted the steam engine yet."

Customers tell us they get MORE for their money... that's why they buy these

3 JOHNSON PRESSES

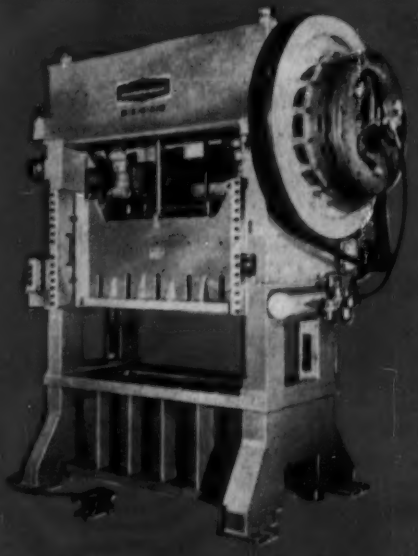
OBI

23 Models ranging from 16 to 150 tons capacity in regular, special wide or high speed types—pin or air clutch.



GAP DOUBLE-CRANK

60-100-125 and 150 ton capacities, steel fabricated, air clutch, flywheel or geared models.



STRAIGHT SIDE DOUBLE-CRANK

40-60-80-100-125 and 150 ton capacities. Tie rod, steel construction and air clutch.

Write for Bulletin 1956

Johnson

MACHINE and PRESS CORP.

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HIGH CHROME
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HARDENED AND
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Fluidmotion

GRINDING WHEEL DRESSERS
WITH SENSITIVE
MICROMETER LEAD SCREW

Forms wheels to shape easy as ABC

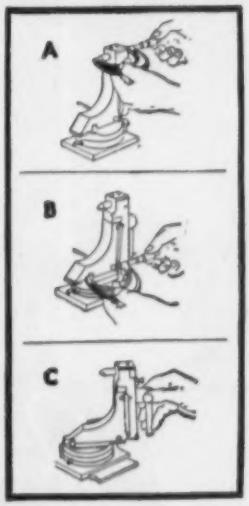
ON INTERNAL • CYLINDRICAL • SURFACE GRINDERS • TOOL AND CUTTER GRINDERS

With the unique "Fluidmotion" Dresser you can dress two angles tangent to a radius—using one handle in one continuous motion. Operation is so fast and simple that beginners can use them.

Available in several models to form dress wheels from the smallest sizes up to 24" in diameter.

Fully Adjustable, adaptable and semi-automatic in operation, the FLUID-MOTION Wheel Dresser is the only one requiring only a micrometer for setting to obtain any desired form.

Representatives in principal cities of the U.S.



A. Measure over diamond point to back of micrometer plate.

B. Add required convex radius or subtract required concave radius.

C. Tighten gib. Dresser ready for action.

See your industrial distributor or write for free literature.

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J & S TOOL CO., INC. | **CLAMPCUT**

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LIVINGSTON, NEW JERSEY

him in his trouble. Cases like this one have come up before. If the man has a good record in the shop, and is in deep personal financial trouble, it might be better for the company to assist him, perhaps through the medium of a company fund set up to make loans to employees. Some funds of this nature are built up by regular, small contributions from the employees. Many companies have such funds, administered by management and the workers, so that each case is judged by its fairness to all. However, if the man continues to take on other debts after once being helped, there is no alternative but to dismiss him. It is up to management to decide just how valuable the worker is to the plant, and if the cost of training a replacement is greater than the loan to clear the debt. The man should be made to understand that the company will help him provided he mends his ways and that this is the last time it will be done. If he forgets his lesson and contracts more debts later on and his money troubles again become a serious problem, it is best to let him go, hoping that some day he will learn his lesson, but not at the expense of the company.

Harry Kaufman
Philadelphia, Penna

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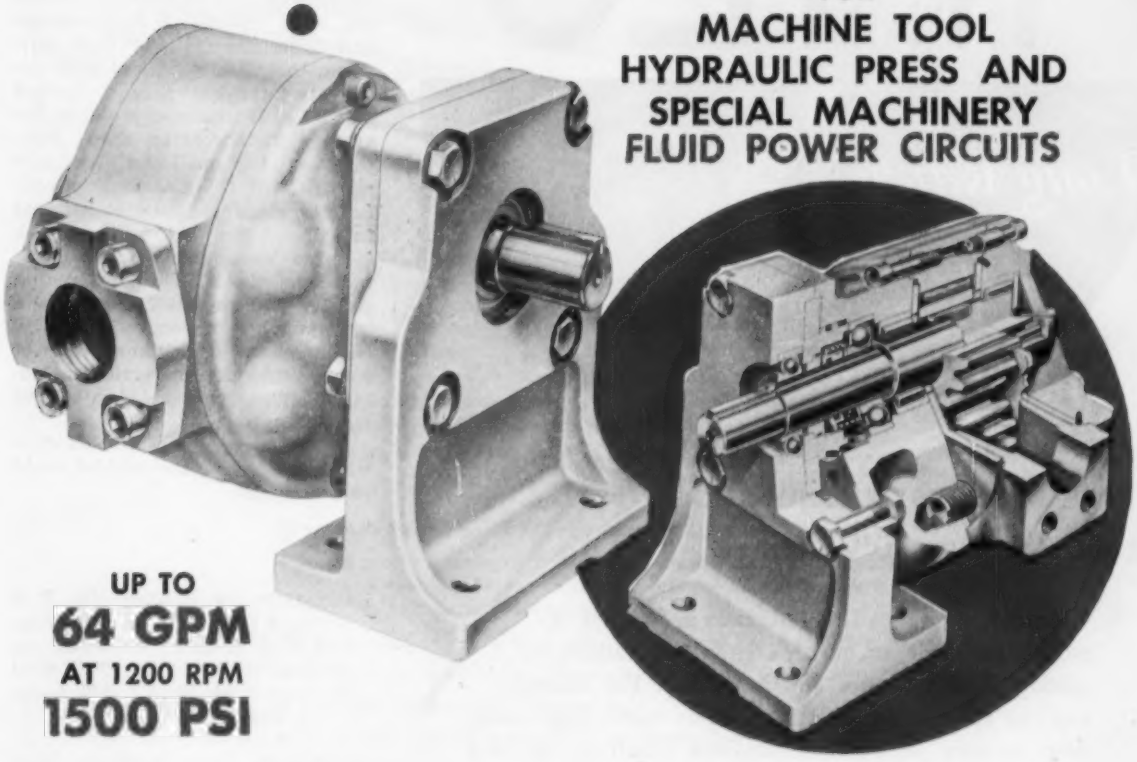
GEAR PUMPS
WITH INDUSTRIAL MOUNTINGS

FOR

MACHINE TOOL
HYDRAULIC PRESS AND
SPECIAL MACHINERY
FLUID POWER CIRCUITS



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AT 1200 RPM
1500 PSI

HYDRECO Gear Pumps, for years, have been specified as standard Fluid Power equipment by the *big names* in Construction, Earth Moving and Materials Handling Equipment. On these rugged-service applications HYDRECO Gear Pumps perform with outstanding dependability. They will operate under conditions of pressure, temperature, and speed unheard of on the usual industrial application. Mobile Equipment is a highly competitive field and HYDRECO Pumps have always afforded design engineers substantial economies in original equipment costs!

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Make this simple test! If your hydraulic cycle is comparable to that of a tractor-shovel digging a foundation . . . a front-end loader working a gravel pit . . . or, a mammoth bulldozer crowding a bank . . . and working at full relief pressures nearly all the time—then YOU can use HYDRECO Gear Pumps to advantage! HYDRECO Gear Pumps can save YOU money NOW—in both original equipment and replacement costs.

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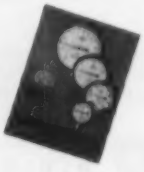
Check Motions or Dimensions In .001" up to 10" Range.

Ames Long Range Dial Indicators in a variety of models are made for quality control applications requiring close tolerance and inspection. For example, you can measure in .001", long slide travel, large cams, deep recesses or other dimensions requiring indicator spindle travel of up to 10".

In addition, Ames Long Range models have all the advantages that are built into Ames regular indicators:— dials of large diameter; easy-to-read, widely spaced graduations; movable dials; replaceable contacts. All Ames Long Range indicators have count hands to indicate revolutions of the indicator hand. Those with box covered, rack guide have a slot in the cover graduated to register each inch of spindle movement.

Write today, sending your problem in long range measuring. Ames will be glad to suggest a solution. Be sure to include drawings and specifications – your answer will be back faster if you do.



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MANUFACTURER OF MICROMETER DIAL GAUGES • MICROMETER DIAL INDICATORS

New Books . . .

ALLIED'S ELECTRONICS DATA HANDBOOK—*Edited by Nelson M Cooke, USN (retired). Published by Allied Radio Corp, 100 North Western Ave, Chicago 80. 64 pages. Size 6x9 in. Price 35¢*

This booklet was really prepared for the majority of Allied's customers, who include radio amateurs and experimenters. For their purposes, the book is packed with excellent data; but only a limited amount of it would be useful in the average metalworking shop. Still, the booklet is small and gives only essentials. It contains basic electrical and electronic information, and could be of great help when needed.

It has elementary electrical formulas, standards on wire gages and resistor and capacitor markings, a large number of conversion tables, trig functions, logarithms, tables of vacuum-tube replacements (including TV tubes), and tables on battery replacements.

In a shop with considerable electrical equipment, the booklet could be invaluable.

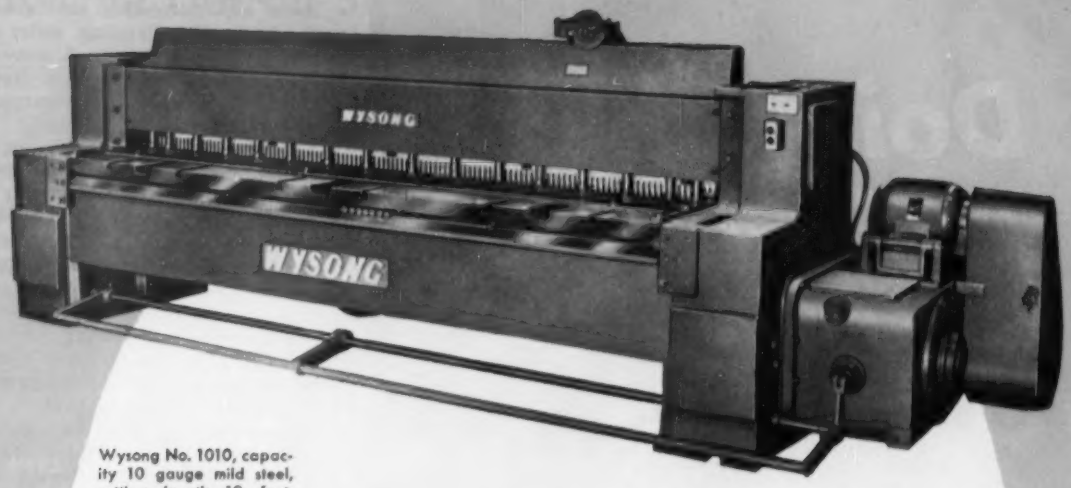
•

ENGINEERING IN HISTORY—*By R S Kirby, S Withington, A B Darling, and F G Kilgour. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, NY. 530 pages, 6 x 9. Price $8.50.*

A scholarly work, copiously illustrated and fully documented, that traces man's development of engineering works from remote antiquity to modern times. The authors are to be complimented upon the depth of their research, their complete freedom from bias, and their evident refusal to accept easy solutions to the problems posed by some of the engineering marvels of early times.

One has no need to be an engineer to thoroughly enjoy reading how man's ingenuity overcame the natural obstacles of gravity in the raising of huge masses of stone, how he learned to control the flow of water and divert it to his own purposes, how he quarried stone without power tools and explosives, and how he built highways and bridges.

To the student of history there is a wealth of information on the customs of early peoples and the effect that engineering had upon the



Wysong No. 1010, capacity 10 gauge mild steel, cutting length 10 feet.

Greater Accuracy! Greater Production! Less Maintenance Costs!

Hi-tensile casting construction gives the necessary weight and mass to Wysong squaring shears. With a tensile strength of 35,000 to 40,000 P.S.I. hi-tensile casting construction can resist the shock and pounding a shear must take. The heavily ribbed table, knife-bar and end frames resist sag or deflection and *maintain accurate alignment*. Because hi-tensile castings absorb vibrations, Wysong shears run quieter and smoother.

Standard features of Wysong shears include:

- Automatic, compensating holddown. Each foot under individual tension. Compensates for varying thicknesses in metal and permits simultaneous shearing of different thicknesses.
- Ball bearing precision back gauge. Adjusts to .0078 (1/128th) inches.
- Time proven, trouble free, 9-jaw clutch with built in non-repeat unit.
- Straddle mounted gears, run in oil.
- Metal finger guard, mounted on holddown. Does not obstruct view of cutting line.

Wysong shears can be equipped with power operated back gauge, a light gauge, remote control switch, automatic lubrication, extension gauges, and rubber pads for holddown feet. Rake of top blade can be changed for cutting plastics, composition sheets and special metals.

Wysong also builds air power and foot operated squaring shears and bending rolls. See your dealer or write to factory for full information.

Buy a Wysong... It's miles ahead.

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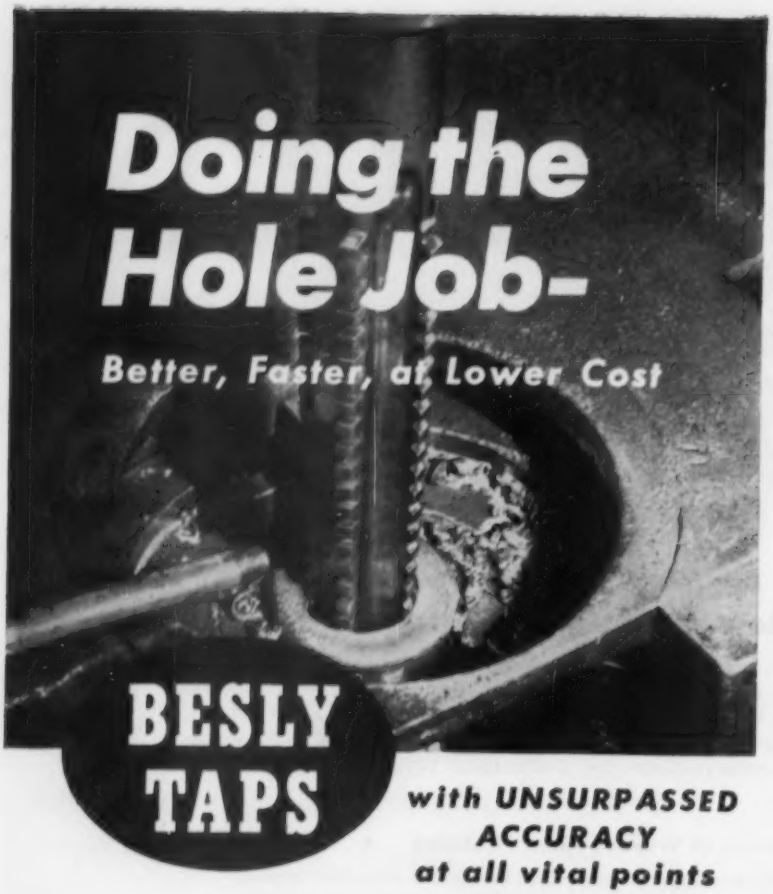
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development of civilization, and there are interesting sidelights to show that city planning, water supply, and sewage disposal were understood and practiced in Roman times to a degree scarcely surpassed in our own time.

Step by step, the reader is advanced along the road to the development of power, the industrial revolution, the construction of roads, canals and bridges, the development of the steamship and the railroad, and the making and application of iron and steel.

Electrical engineering, modern transportation, sanitary and hydraulic engineering, and the construction of modern buildings, bridges, and tunnels are each dealt with in turn, with the record of early failures and triumphs. It is only to be regretted that the authors did not see fit to include something of the history of machine tools and the art of metalworking which can justly claim an equal share with civil engineering in the development of civilization. But perhaps this is too big a field to be included in the one book, and one can express the hope that the authors may someday produce a work in this area of engineering that will rank as high as the present volume.

•

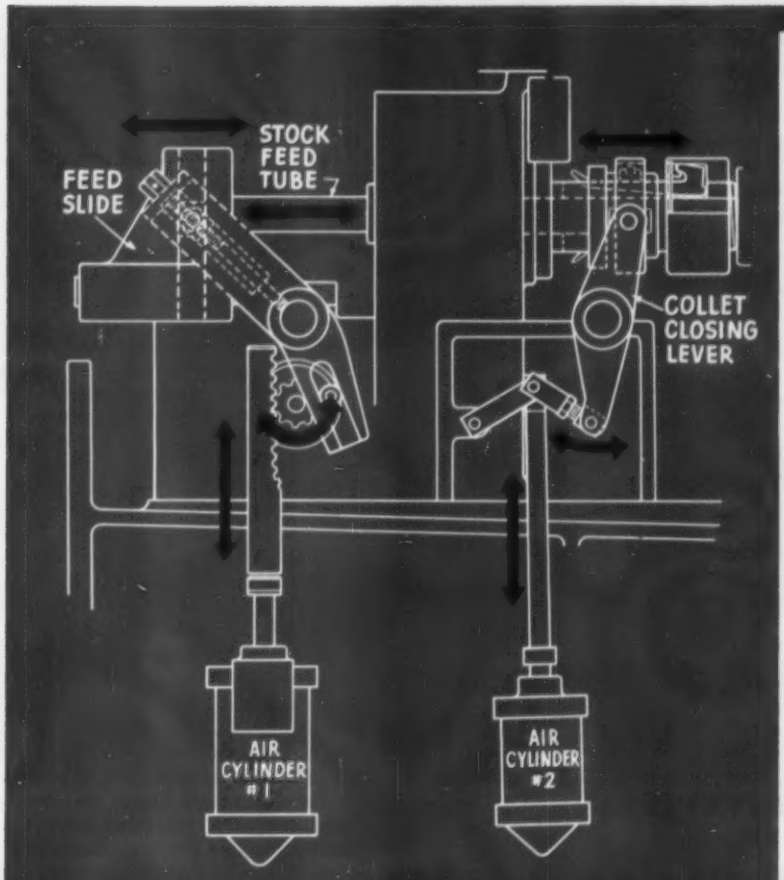
UNITS AND SYSTEMS OF WEIGHTS AND MEASURES—*By Lewis V Judson, National Bureau of Standards Circular 570, 29 pages, 12 halftone illustrations, 25 cents. (Order from the Government Printing Office, Washington 25, DC)*

Millions of daily industrial operations and commercial transactions depend on a uniform and convenient system of weights and measures. In its broadest sense, however, the subject of weights and measures covers much more than the units used in the sale and purchase of commodities. Our high standard of living depends in large part on our ability to measure accurately everything from a loaded railroad car to the diameter of a submicroscopic particle. In fact, almost everyone makes daily use of an accepted system of measurement—from the school child who studies arithmetic to the machinist who measures to a ten-thousandth of an inch, from the housewife who purchases a pound of butter to the manufacturer of automotive engines. Circular 570 brings together much of the information that was previously available in separate mimeo-

How the Detroit Screwmatic 750 Utilizes

AIR POWER CONTROL

For design simplicity and trouble-free performance



Behind the smooth, accurate performance of the Detroit Screwmatic 750 lies a simple, yet effective, self-cushioning air power system. It controls the stock feed, collet chuck, and swing stop.

All mechanical linkage to the camshaft is eliminated.

The units are activated by dogs on the upper camshaft carrier wheels.

Collet can be manually operated at any time.

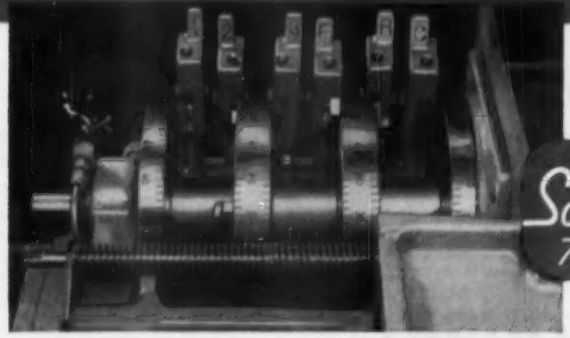
Feed slide is easily set to graduated scale by a self-locking screw.

The swing stop is cut in by a selector valve.

This new concept of air power control for a single spindle bar automatic assures:

- minimum moving parts
- long, trouble-free performance
- easy replacement and maintenance

For detailed facts on the many unique innovations of the Detroit Screwmatic 750, write today for a new 16-page folder.



All trip levers are clearly visible and located at the top of the machine. Spindle speeds, reversing, and chucking are quickly set by trip dogs on graduated carrier wheels.

A product of

THE GEAR GRINDING MACHINE COMPANY

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Manufacturers of: • Fully Automatic Gear Grinding Machines • Rzeppa (Sheppa) Constant Velocity Universal Joints.

graphed leaflets. For more extensive information on the subject, the Bureau has published Units of Weights and Measures, Miscellaneous Publication 214. (40 cents)

THE BIG ATTRACTION—*Produced by Ransburg Electro-Coating Corp, Barth & Sanders St, Indianapolis 7, Ind. 16 mm, color, sound. Running time 30 min. No charge.*

Intended primarily for executives and others interested in production-line painting, this film starts by giving a brief explanation of the Ransburg No. 2 electrostatic system of paint application. The scene then shifts to actual production plants where the process is seen in operation and cost reduction figures are given. Jobs vary from the application of porcelain enamel at GE, to the painting of automobile chasses, lighting fixtures, toys, filing cabinets, and door knobs.

Other shots show some of the 22 conveyorized test laboratories where new applications are worked out and proved for production-line installation.

STAHL UND EISEN-75 JAHRE (75th ANNIVERSARY EDITION OF STAHL UND EISEN) *Directed by Dr Ing Kurt Thomas. Organ of the Verein Deutscher Eisenhuttenleute. Published by Verlag Stahleisen MBH., Dusseldorf (Germany), July 12, 1956, 410 pages.*

This special anniversary issue of "Stahl und Eisen" reflects the vigorous rebirth experienced by the German steel industry in the last decade.

The lead article traces the development of the magazine over the last twenty-five years, since the publication of the 50th anniversary issue in the troublesome days of the depression. Economic conditions of the industry then forced the magazine to retrench and diminish in size. Recovery was gradual, but World War II brought the magazine to the brink of extinction.

The return has been spectacular, bearing out the claim that the fortunes of the magazine have paralleled those of German industry.

Other articles cover the sintering of ores, the use of magnesite tuyere bottoms in a Bessemer steel plant, analysis of power requirements for hot shearing of steel, effect of small chromium and nickel content on the properties of steel parts, a study of brittle fractures, and the economics of the galvanizing process.

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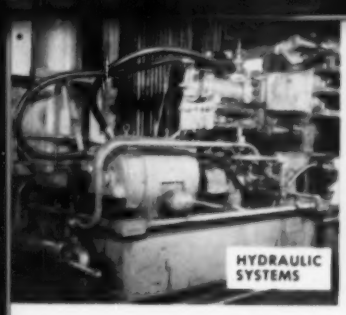

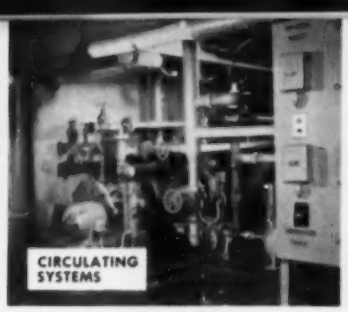

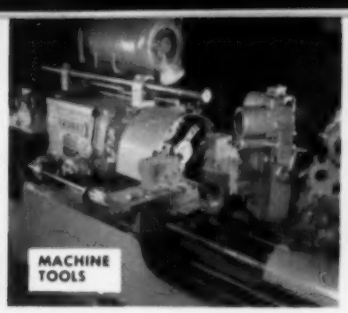

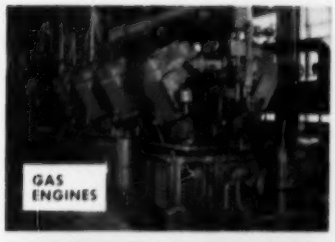

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For technical information, see your Sun representative, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-51.

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Valve on left is from compressor run for 3,000 hours with well-known, high-grade oil. At right is same valve after a 3,000-hour run with Sun Solnus oil. Note difference in carbon deposits.

3000-HOUR TEST PROVES SUN SOLNUS OILS REDUCE CARBON BUILD-UP IN COMPRESSORS

Equipment: A three-stage Norwalk horizontal-type compressor. Operating pressure: from 1,000 to 1,500 psi.

Test: The compressor was cleaned thoroughly and filled with a well-known, high-grade oil. The equipment was run for 3,000 hours, then torn down for inspection and cleaning. Then Solnus® 300 was tested in the same way.

Results: Look at the two pictures. You can see for yourself how Solnus oil reduced dangerous carbon build-up.

All types of reciprocating air compressors that have been changed over to a Sun Solnus oil show similar results. A test in your compressor will show the same remarkable reduction of carbon deposits.

You can get a technical bulletin about Sun Solnus oils by asking your Sun representative, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-52.

SUNOCO®

INDUSTRIAL PRODUCTS DEPARTMENT

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New Films

NATIONAL DIRECTORY OF SAFETY FILMS, *1956—Published by National Safety Council, 425 N Michigan Ave, Chicago 11, Ill. Price $1.*

Listing more than 1200 films that are available without restriction on distribution, this directory provides a compact source of information on films on safety, first aid, fire prevention, and civil defense. Information includes size, running time, color, year of production, and a brief summary of the plot.

Each film is available for purchase, rental, loan, or long-term lease from one or more of 292 distributors. A separate listing is given for films restricted to certain specific areas.

•

TRANSFLEX—AUTOMATION IN ACTION. *Produced by Clearing Machine Corp, c/o US Industries Inc, 6201 W 63rd St, Chicago 38, Ill. 16 mm, color, sound. Running time 22 min. No charge.*

Filmed around an automated press line which produces automotive wheels, this film describes in detail the construction of the feed mechanism, the operation of the press line, and the significance of Transflex—a new concept of press design.

•

INTRODUCTION TO WORK SAMPLING. *Produced by University of California, Educational Film Sales, Los Angeles, Calif. 16 mm, sound, color or black and white. Running time 91 min. Rental: color $6.00, b&w $3.50. Sale price: color $175.00, b&w $80.00.*

By means of a large panel containing 480 wood blocks representing the 480 minutes of a work day, the film explains and demonstrates how a random sample can be used to predict the whole. It shows also how random sampling may be used for measuring work, as well as measuring delays and idle time.

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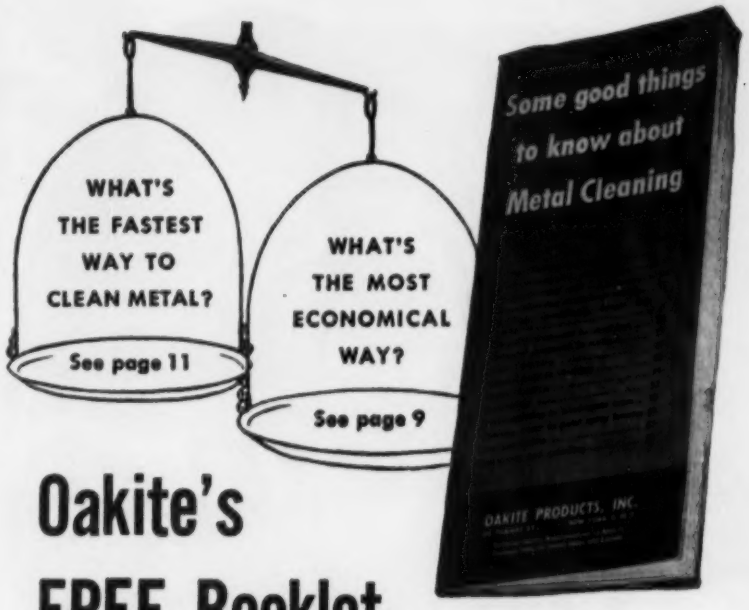
MOTION PICTURES AVAILABLE FROM MEMBERS. *Published by National Machine Tool Builders' As-*


WHAT'S THE FASTEST WAY TO CLEAN METAL?
See page 11
WHAT'S THE MOST ECONOMICAL WAY?
See page 9
Some good things to know about Metal Cleaning
OAKITE PRODUCTS, INC.

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answers many questions that mean better production, more profit for you. Just look at the table of contents:

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- Electrocleaning nonferrous metals
- Pickling, deoxidizing, bright dipping
- Applying iron phosphate coatings in preparation for painting
- Applying zinc phosphate coatings
- Cleaning, removing rust and conditioning for painting in one operation
- Machine cleaning methods
- Paint stripping
- Steam-detergent cleaning
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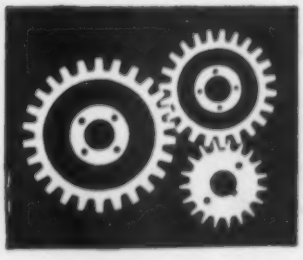
From huge aircraft engines to tiny precision instruments — there's no end to the variety of products improved by Perkins custom-cut Gears!

Perkins is a gear engineering organization with a 35 years' tradition of New England craftsmanship as background. As one of the country's largest producers of gears to customers specifications, Perkins will meet your specific requirements for gears—regardless of size, type, material or quantity desired, and at competitive prices. You furnish the specifications, we'll produce the gears.

PERKINS MAKES in all materials, metallic or non-metallic, and in any size, to your specifications: helical gears, bevel gears, sprockets, ratchets, worm gears, spur gears with shaved or ground teeth, ground thread worms.

NOTE: The **PERKINS PRECISION SPRING COILER** is the latest development in the spring coiler field and eliminates entirely the use of arbors and long set-up time. It is a complete self-sufficient machine and enables you to make the spring you want *when* you want it — in seconds. The coiler produces any type of spring, in any diameter and any pitch with this range: Wire Sizes .005 to .125. Diameter from 3/32" to 12" and larger. Size of the compact coiler is only 7½ x 16". **A POWER MODEL** mounted on a welded steel console cabinet base is also available. Full information on request.



Perkins Machine & Gear Company

101 Circuit Ave.
West Springfield, Mass.

sociation, 2071 East 102nd St, Cleveland 6, Ohio. 24 pages, paper bound. No charge.

Listed alphabetically by company, as well as by subject, this new publication briefly describes 123 motion pictures available from member companies of the Association. Information given includes size, color, sound, and running time. The booklet is obtainable from NMTBA, but individual films must be requested from the company concerned.

•

PROCEEDINGS—PORCELAIN ENAMELING INSTITUTE. *Published by Porcelain Enameling Institute, Association Bldg, 1145 Nineteenth St, N W, Washington, DC. 32 pages. Price $2.00.*

The proceedings of the mid-year meeting of the PEI General Enameling Division include, "Sound Financial Management in a Growth Industry," "Color from the Porcelain Enameler's Point of View," "The Outlook for General Enameling," and "Requirements for a Good Accounting System." Also included are four "How We Do It" reports on industry cost systems.

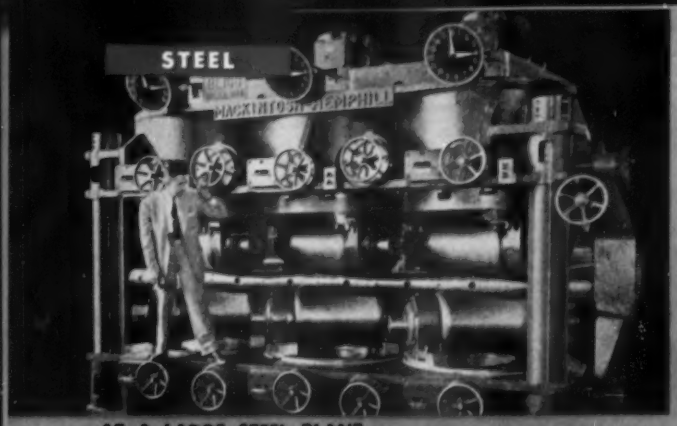
•

THE HOBBING PROCESS. *Produced by Barber-Colman Co, Rockford, Ill. 46mm, color, sound. Running time 22 min. No charge.*

Just what goes on when the teeth of a hob are brought into contact with a gear blank is explained in complete detail by a combination of animation and slow-motion photography. Close-ups show how each hob tooth makes a straight-sided cut to produce a curved tooth form, and schematic drawings outline the basic gear train of a hobbing machine and give information on the various constants.

The viewer also sees how the conjugate hob form is determined and is made to understand the relationship of gear and hob tooth forms. The effect of tooth modifications is clearly illustrated, and there is an interesting explanation as to why multiple-thread hobs usually provide less accuracy than single-thread hobs.

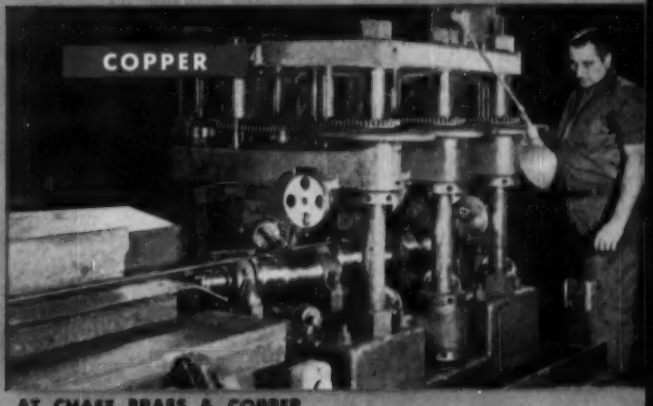
Everyone who has any connection with the production of gears by hobbing, whether in engineering or in the shop, should make a point of seeing this most enlightening film.



AT A LARGE STEEL PLANT...
This A-5 recently shipped to an eastern steel plant is the largest 6-roll straightener in the world; straightens electric-weld steel pipe in diameters between 4½" and 16", in 16-to-65 foot lengths at speeds up to 240 feet per minute. It illustrates the three-post design now available in large models of the Mack-Hemp straightener.

AT ALCOA...
This Model AX has recently gone into operation at Alcoa's New Kensington, Pa., plant. It straightens from 100 to 150 tons of aluminum alloy tubing every month. Guideless design and power drive to all six rolls enable Mack-Hemp to successfully production-straighten easily-marked aluminum tube.

AT BELL AIRCRAFT...
At this aircraft producer's Buffalo plant, this three-post Model AY straightens 3/16" O.D. 304 Stainless Steel tubing which Bell makes into rocket engine components. The machine raised Bell's straightening capacity from 570 feet to nearly 7500 feet per day... more than *thirteen* times as much!



AT CHASE BRASS & COPPER...
This Model AN, with capacity of ½" to 3" O.D. is one of three Mack-Hemp straighteners at Chase's Cleveland plant. The Models AXY, AX and AN together provide overlapping capacity for 3/16" up to 3" O.D., in straightening brass or copper tube and in "light tempering" annealed copper tube.

For premium tube straightness and roundness at high production speeds...

The MACK-HEMP Guideless Rotary Tube Straightener

- All six rolls driven—no guides—surface of straightened tubing is unmarked.
- Eliminates end bends and ovality; provides premium straightness and roundness over full length of tube.
- Rugged, heavy-duty construction.
- Models for all O.D.'s from 0.050" to 16" of ferrous and non-ferrous pipe and tube.
- Speeds up to 800 feet per minute.
- Easy to reset for different diameters—all models now available in three-post construction. Fast roll adjusting mechanism is enclosed and protected from scale and water.

ALL MODELS ARE NOW AVAILABLE IN MACK-HEMP'S EXCLUSIVE THREE-POST CONSTRUCTION

For complete details on Mack-Hemp Straighteners, write today for a free copy of our 24-page Technical Bulletin No. 55, "How to Straighten Pipe and Tube."

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Typical parts made of Alcoa Aluminum Screw Machine Stock by Enterprise Mfg. Co.

HOW PFLUEGER* MAKES MORE AND BETTER REELS WITH ALCOA® ALUMINUM SCREW MACHINE STOCK

Since Civil War days, 3 generations of Pfluegers have parlayed a small harness business into the giant Enterprise Manufacturing Company of Akron, Ohio . . . one of the world's foremost makers of fishing tackle. Alcoa Aluminum Screw Machine Stock has contributed to the sales appeal of Pflueger reels since 1929.

The Pflueger success story is typical of the competitive advantages frequently gained by a switch to aluminum screw machine stock. Its free-machining qualities speed production by permitting operations at maximum spindle speeds . . . with less tool breakage, fewer rejects, better finish with fewer secondary operations. It has longer tool life, provides three times as many parts per pound of metal. And abundant supplies are available.

All these solid economic advantages point up the wisdom of a hard commercial look at aluminum screw machine stock. Alcoa will provide you with technical assistance, alloys information, and the greatest store of experienced counsel available in the industry. Just call your nearby Alcoa sales office, listed under "Aluminum" in your phone book. Aluminum Company of America, 868-K Alcoa Building, Pittsburgh 19, Pennsylvania.

PFLUEGER

IN PURCHASING

Wayne Miller, Director of Purchasing, says,

"Pflueger reels have used aluminum parts since 1929 . . . and we've always bought our metal from Alcoa. Alcoa's personnel have always been most cooperative. Their shipping dates and promises always hit together. We especially like the shipping notices Alcoa forwards to us. Tolerances and composition always meet our most exacting specifications. Engineering help and warehouse service continue to keep us happy."

IN DESIGN

Mr. Tom Sarah, Chief Engineer of Design and Development, says,

"Our annual sales conference guides design policy. Customers began to insist on lightness; we were given the job of lightening up while still maintaining quality and dependability. Aluminum looked like a natural . . . and was. It takes the high-quality finish we require. It offers the corrosion resistance so essential when our reels are used in salt-water fishing. And Alcoa's research and development facilities were a great help to us in selecting proper alloys and finishes. We will be using more and more aluminum parts."

IN PRODUCTION

Garnett Young, Foreman, in discussing production with operator John Schmidt (left), says,

"Many of our workers are women and aluminum's light weight eases our materials handling. We get longer tool life and can hold closer tolerances on operations such as drilling, milling, tapping and machining. We cut fine-pitch threads and we prefer aluminum for this more than any other metal. Because aluminum is easier on tools, we get less heat and can use lighter oils. With aluminum, we have no trouble with concentricity. We run at top spindle speeds. There's less chip trouble and we get high prices for our scrap. If trouble develops, Alcoa sends engineering help to straighten us out in a hurry."

IN OUTSIDE SUPPLY

Some parts of the famous Pflueger reels are made by Locke Machine Company of Cleveland, Ohio. (Member of the National Screw Machine Products Association.) Here Mr. A. W. Glasheen, Estimator; Mr. J. E. Tomer, Vice President and Mr. E. H. Baker, Factory Manager, discuss the finish requirements of a Pflueger reel. They say, "Pflueger demands tight tolerances and a superfine surface finish. We find it easy to comply by using Alcoa Aluminum Screw Machine Stock. Tool life is good and we use extremely heavy machine feeds. Concentricity requirements are close, but we maintain them with aluminum. Our operators like to work with aluminum and we like to deal with Alcoa. Service has been extremely prompt, and their quality is excellent. We feel it is the best on the market. We have never had to reject Alcoa Screw Machine Stock.

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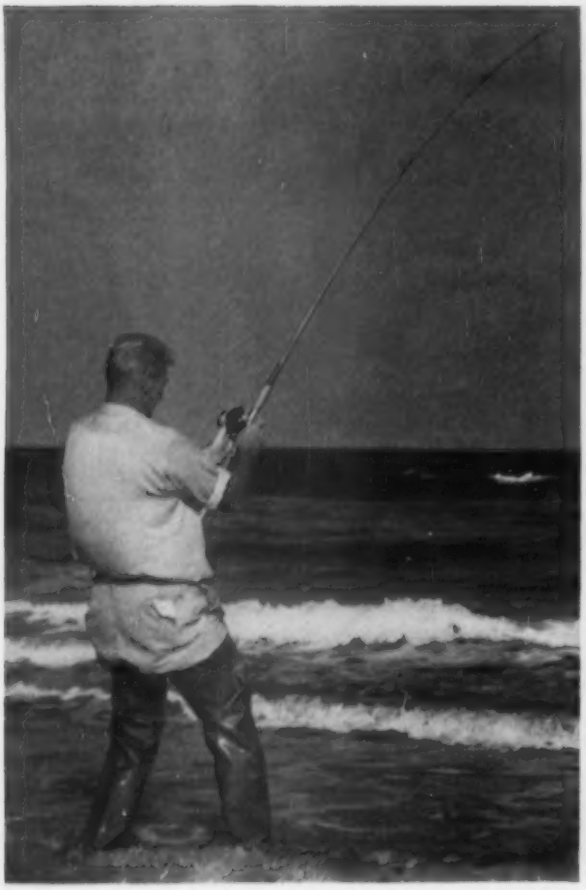
Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM
SCREW MACHINE STOCK



Carpenter Free-Machining Stainless eliminates expensive handwork on fishing reel shaft

Excessive burrs when machining this level wind shaft for a fishing reel were constantly interfering with maximum productivity. Other important factors on the job are good corrosion resistance, and long wearing qualities.

Seeking improvement not only in the product, but also in its manufacture, the company decided to try Carpenter Stainless No. 5 (Type 416). The results were exactly as anticipated . . . easier, more uniform machining properties and burr-free finishes took the job out of the doubtful class and made it a profitable operation. No. 5 eliminated expensive hand work on the shaft, and put this job on a profitable, productive basis.

If you're not now using Carpenter Free-Machining Stainless, here's a real opportunity to improve production of stainless parts and products. For immediate delivery, call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor.

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are you running hard...

Conservative studies of growth potentials and long range trends, by both industry and government, show clearly that markets are already outrunning the labor supply for industrial production. The pace will get increasingly faster as our growing population demands more goods and services.

Those companies which stay in the race will do so by stepping up their productivity per man hour, and planning their capital expenditures accordingly. They will not stumble over the problem of machines displacing men, because they know there will not be enough labor to fill all the jobs created in the next ten years.

Avey production machines have already increased productivity per man hour, per square foot of plant space, and per dollar of invested capital in many plants. Their fast rate of return makes it profitable and pleasant to stay in the running.

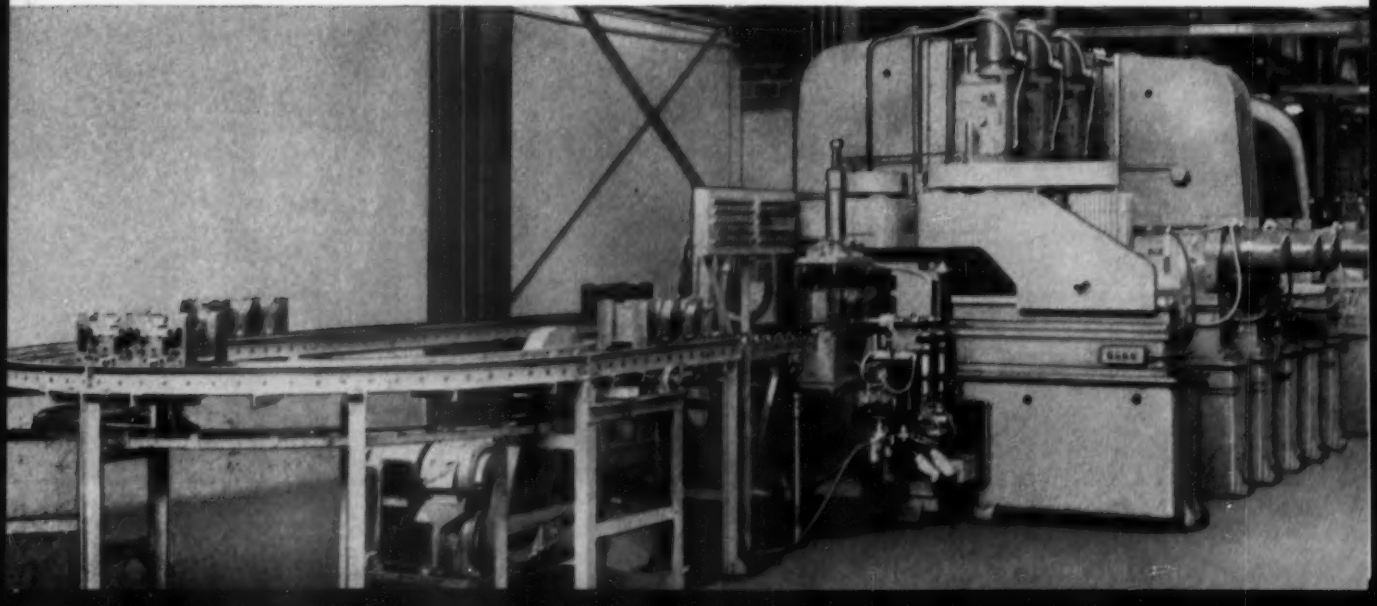
▸ **production data:** This machine automatically rough and finish mills, drills, countersinks, and taps 260 hydraulic pump covers per hour. Operations include automatic gauging, probing, and insertion of bronze bushing in bore.

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines

and losing ground?

Avey



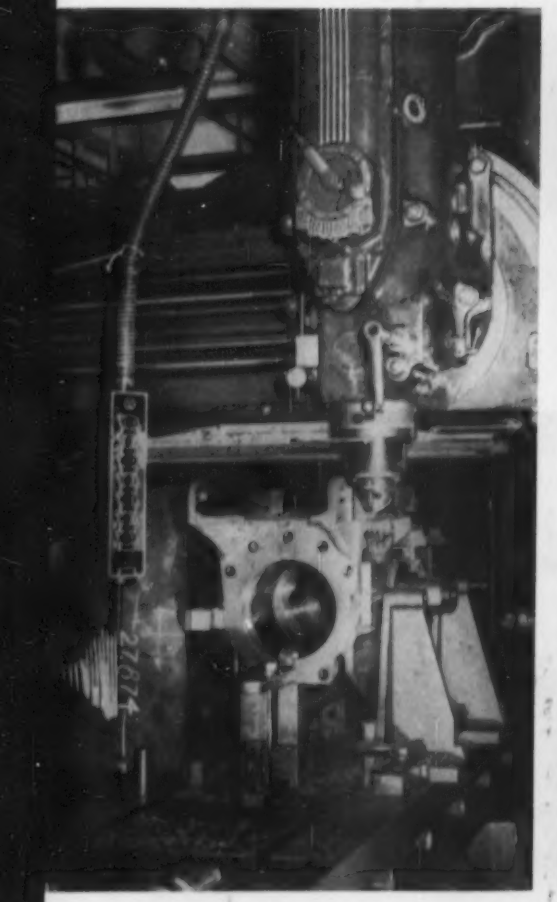
Tough Machining and

. . . see Sections B and C and Buyer's Guide Issue

NEW YORK—Subscribers with machining and tooling problems will find "Production Nuggets"—the essence of production ideas published in American Machinist throughout the year—in Sections B and C of American Machinist's 1957 Production Planbook and Buyer's Guide Issue due to be mailed Mid-November, 1956. Each "Production Nugget" summarizes one idea from a previously published article, with issue date and page number for subscribers who want more specific details with drawings, diagrams and illustrations.

Subject matter in Section B will cover articles related to machining ideas—metal removal techniques and production equipment required, such as planing, milling, turning, grinding, and drilling; automation devices and methods reported during 1956; cutting fluid and coolant developments; grinding wheels; and other adjuncts to metal removal. For example:

Grinding speed for titanium is extremely critical. For a given alloy and a given cutting fluid, there will be one speed at which minimum wheel wear is experienced. For surface grinding, speed may be 1500 sfpm, table feed of 400 to 500 ipm, downfeed 0.001 in. per pass, crossfeed 0.05 in. For internal grinding,



Tooling Problems?

in AM's 1957 Production Planbook for new ideas and techniques . . .

wheel speed should be below 1800 sfpm, work speed 40 sfpm, feed 0.002 in. AM—Aug 15 '55, p97

Small lots, as few as 10 pieces, can often be handled to advantage on copying lathes. Change-over time is short because there is usually only one templet and one tool to change, higher speeds are possible because a single-point tool produces less vibration than multiple-tool setups, and secondary finishing operations can be reduced or eliminated. AM—Sept 12 '55, p138

Section C's "Production Nuggets" will deal with tooling—the cutting tools, jigs, fixtures, dies, holding devices and press tools required for metal removal and metal forming production operations, such as:

Inert-gas atmosphere for welding titanium is maintained by performing work in a steel box built on the table of a welding positioner. Operator works with rubber gloves sealed to chamber walls, views work through windows of ultra-violet-absorbing acrylic sheet plastic. Gas lock permits introducing work and tools without breaking seals. AM—Aug 15 '55, p102

Swivel grinding fixture permits grinding both angles and nose radius on carbide boring bits in a single setup. Grinder has two diamond wheels, the finisher being set 0.0005 in. ahead of rougher to avoid moving fixture. AM—Oct 10 '55, p146

Characteristics of ceramic tools are such that they are better run dry, and run better than carbides at higher temperatures. They may be useful for hot-spot machining. Tip remains cool, and chips do not weld to it. They permit feed and speed combinations well beyond the capacities of most present machine tools, but still give better finishes and higher speeds within the limits of present machines. AM—Mar 12 '56, p157

These two sections will be a "How-to-do-it" reference of machining and tooling ideas and production techniques valued in metalworking plants. And these are only two of eight "Nugget" sections, the others covering management and personnel, molding and casting, inspection, testing and quality control. assembly and heat-treat, materials and components, materials handling and services.

Challenging Checklists

"Developments to Watch in '57"—challenging checklists of up-to-date Metalworking production ideas and techniques appearing in each section will present subscribers with an opportunity directly to choose machining and tooling ideas applying to their own operations and requirements, and adapt them for immediate use.

Lists of "Manufacturers Free Literature," classified by subject matter, will be published in each section—an additional subscriber convenience to permit easy gathering of further information germane to machining and tooling in the same place, these editorial topics are reported—and while production ideas are fresh.

1400 Headings—7000 Sources

Over 7000 sources of supply for the production equipment, materials, parts and supplies will be classified under 1400-odd headings in the Buyer's Guide section of the issue, providing subscribers with a complete and authoritative "Where-to-Buy-it" reference. The headings cover every conceivable product used in Metalworking plants—from Abrasives to Zinc.

A Standing Reference Issue

Year-round usefulness will be built into the volume by thumb-indexing 10 of the 11 sections; flat-opening binding; and shop-oriented classification of topic matter. American Machinist's 1957 Production Planbook and Buyer's Guide Issue is planned as a service exclusive to American Machinist subscribers to provide "How-to-do-it," "What-to-do-it-with" and "Where-to-buy-it" ideas obtainable nowhere else in a single issue.

Photos courtesy AMF-Brooklyn

1957 OUTLOOK

MANAGEMENT, PERSONNEL A

MACHINING B

TOOLING C

PRESSWORKING, MOLDING, CASTING D

INSPECTION, TESTING, QUALITY CONTROL E

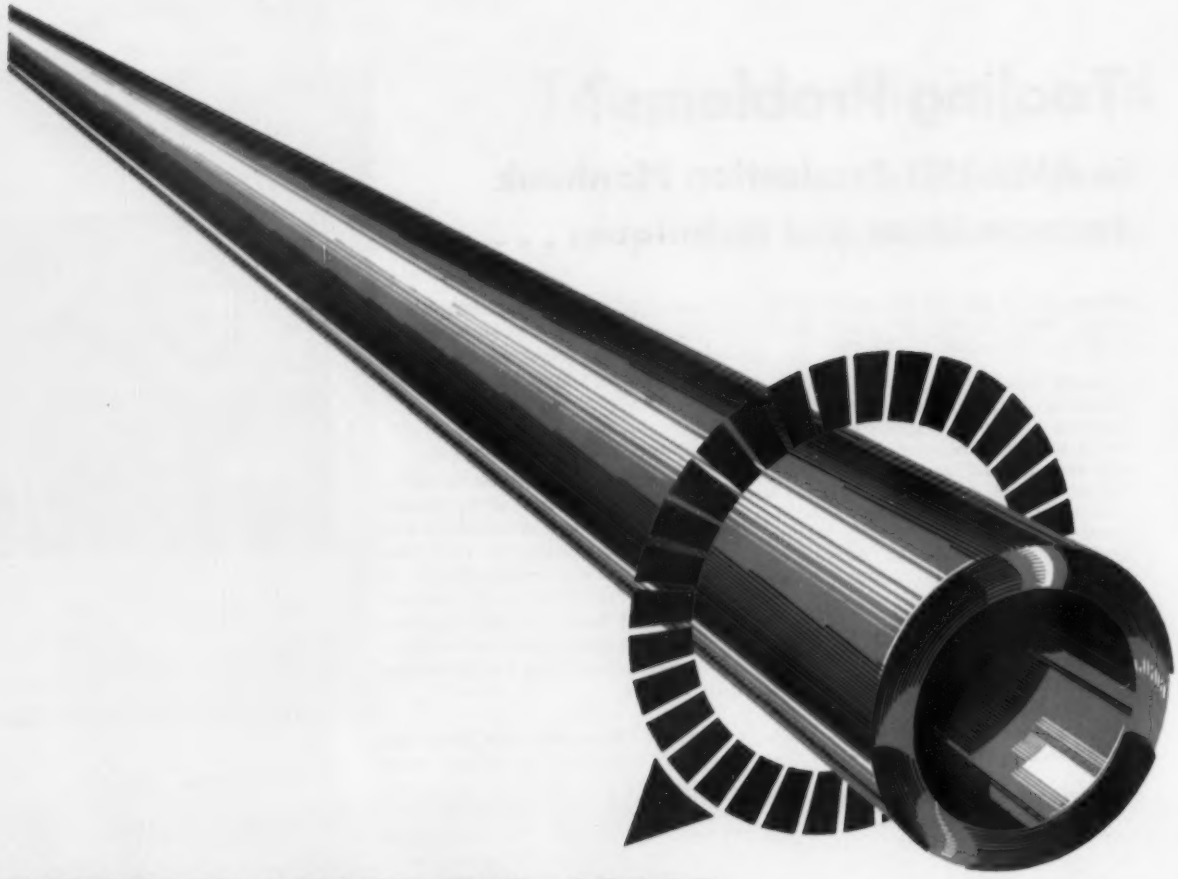
ASSEMBLY, HEAT-TREAT, FINISHING, (ASSEMBLY INCLUDES WELDING & PORTABLE TOOLS) F

MATERIALS, COMPONENTS G

MATERIALS HANDLING, SERVICES H

PRIZE IDEAS, REBUILT EQUIPMENT I

BUYER'S GUIDE J



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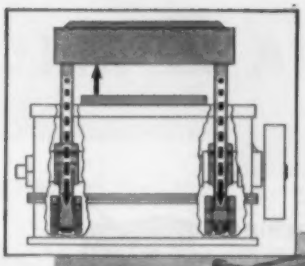

New 350-Ton Dieing Machine. Insert drawing shows advantages of new Double-Crank assembly.

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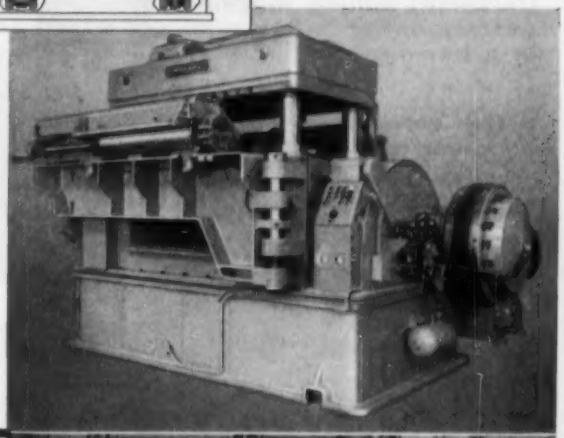

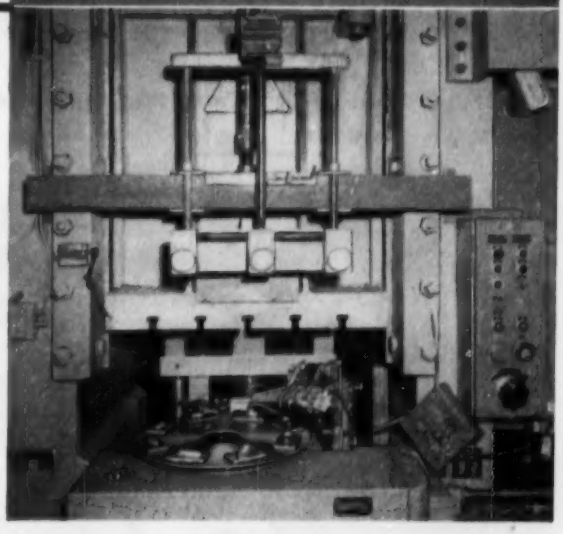

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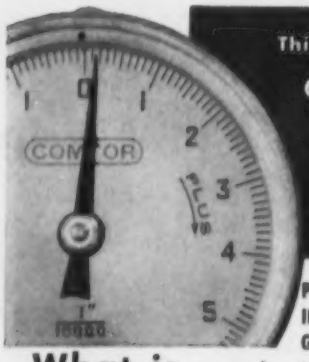

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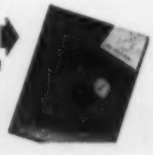

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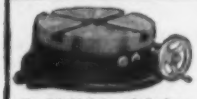

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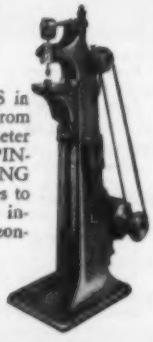

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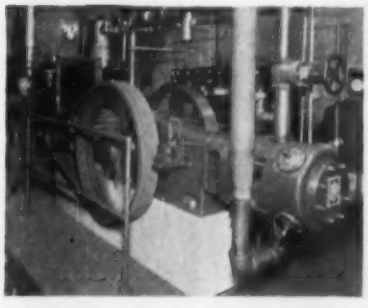
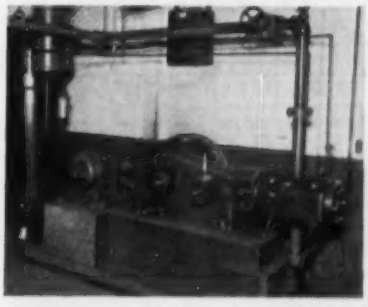
Modern, time-saving, labor-aiding air tools are designed to operate at a working pressure of 90 pounds. As the pressure falls off, so does the performance of the tool. Studies have shown that by increasing air pressure *at the tool* from 70 psi to 90 psi, you can increase the available power of the average air tool by 37%. This means a big increase in productivity—big savings in time and cost.

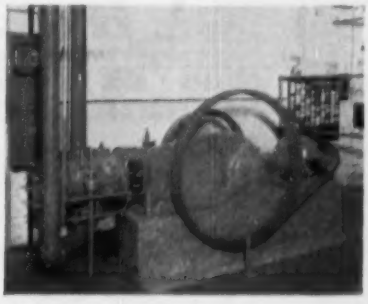
If your increased usage of compressed air has outstripped compressor capacity, an additional heavy-duty ES compressor will be a highly profitable investment. Your Ingersoll-Rand representative will be glad to help you make an air survey and recommend the most economical solution to the problem.



This Class ES compressor provides 100 psi air for operating air tools in the foundry and machine shop of a large manufacturing company.



For more than 15 years, this ES compressor has been providing a dependable supply of air at 100 psi for general plant service in an Eastern metal products factory.



Air tools used in a large woodworking plant are operated at top efficiency by the heavy-duty ES compressor shown above, delivering air at 100 psi.

Only I-R compressors have CHANNEL VALVES

Known for high efficiency, quiet operation and durability. Entirely different. Each valve is a combination of rigid stainless-steel channels and leaf springs, with trapped-air spaces which cushion action.

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THE DIAL INDICATOR CALIBRATOR is used to check and calibrate the accuracy of dial indicators and production checking of pieces having a number of different diameters. The range is 0 to ½" travel of CW or CCW indicators. Direct reading is to .000025". Standard unit set for AGD stem on indicators. (Pat. applied for).

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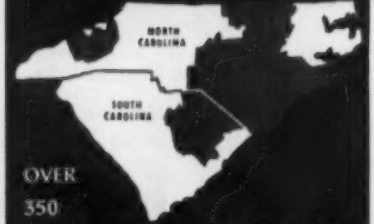

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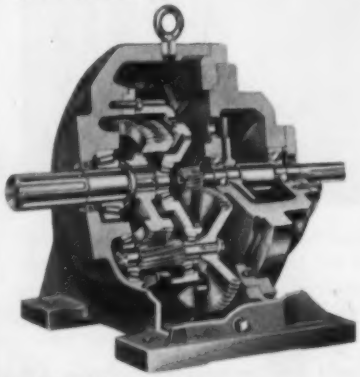

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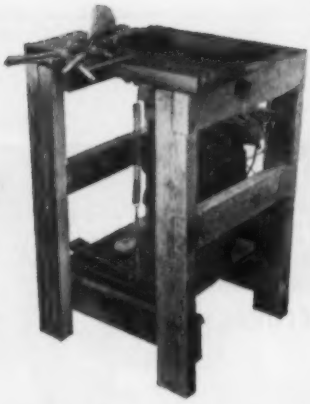

beginning . . .

First experimental multi-spot welder model developed in 1901 for welding fan blades to hubs.

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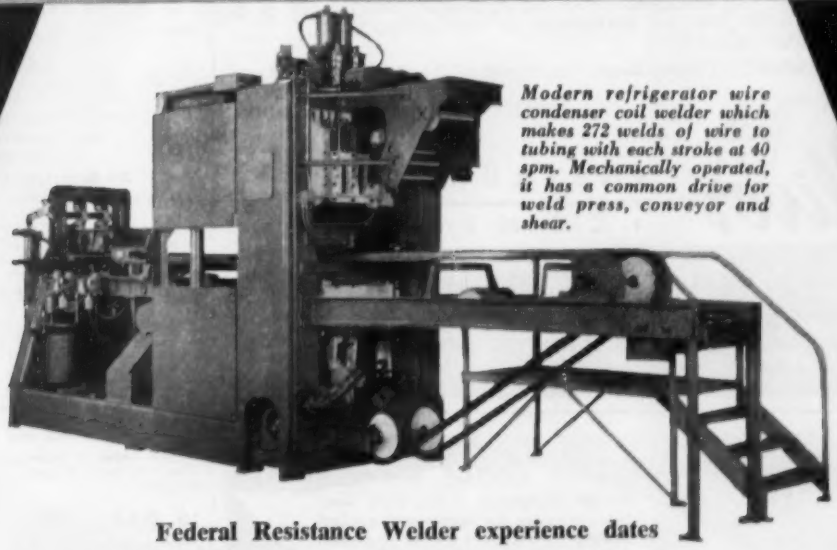
has always been
FIRST IN RESISTANCE WELDING



Modern refrigerator wire condenser coil welder which makes 272 welds of wire to tubing with each stroke at 40 spm. Mechanically operated, it has a common drive for weld press, conveyor and shear.

Federal Resistance Welder experience dates back to the very beginning of resistance welding. From that day to this, Federal has remained "First in Resistance Welding" engineering, design and development.

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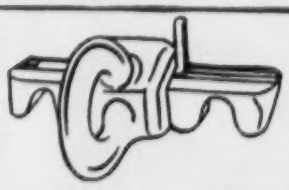
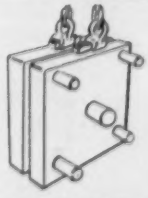
protects fingers by providing roomy gripping space on either side of the die shoe. This flange may be mounted flush or on the edge of the die set and is welded in place. There is no extra charge for this valuable safety feature.



LOCK-JAW LIFTING DEVICE

removes the danger of handling large die sets. Heavy steel components of this device are welded in place forming an integral part of the die set. They are positioned to insure proper balance when the set is lifted by either chain fall or crane.



E-Z LIFT SLING CHAIN

is especially designed to fit the flanges of the die sets. Male jaws attached to the sling fit quickly into place for immediate lifting. There is no need for screw clamps, eye bolts, or lifting lugs.

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THE SHOT OF LEAD THAT STARTED A REVOLUTION!

SECRET OF INLAND PATENTED LEDLOY® PROCESS is this precisely controlled "shot" of lead pellets gunned into molten steel as the ingot is poured.

Leaded steels are re-writing the book on machinability. They go by a variety of trade names . . . but all are made by the patented Ledloy* process developed by Inland Steel.

In 1939, Inland metallurgists working with others engaged in the field of free-machining steel research, developed a new steel that behaved like brass under a cutting tool, yet it had the strength and other properties of high quality open hearth steel.

The secret lies in the method of dispersing an almost infinitesimal amount of lead particles (less than ½ of 1%) throughout the molten ingot as it is poured. Dispersal is so uniform there is no alteration of the steel's basic qualities. Yet this tiny "shot" of lead does amazing things to the steel's machinability. As Ledloy has become more generally available, one case history after another has documented the production increases and lowered costs it makes possible.

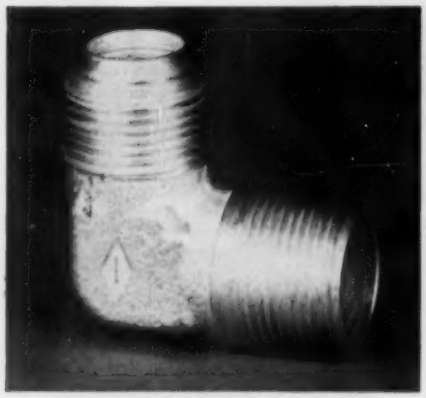
Leaded steels are now made under Inland licenses by a number of manufacturers. But whether the leaded steel you use is called Ledloy or any other trade name, it is made by the patented, closely controlled process that makes the Ledloy family truly the "world's most machinable steels".

Ledloy gives the ultimate performance for which your modern machines were designed.

The fact that Ledloy can be machined at extremely high speeds (up to 45% faster than B-1113 in some cases) is only one reason for its increased productivity. The lead particles in Ledloy actually lubricate the cutting tool during machining. Also Ledloy chips break up into shorter lengths which quickly fall free of the tool, again reducing heat and friction.

Result: greatly increased tool life and less down-time. Production increases of 50% or more are not unusual, yet qualities of open hearth steel are retained.

REJECTS PRACTICALLY ELIMINATED on this heat control element when Ledloy replaced non-leaded steels. Machining speed increased 42.5%, tool life was prolonged with drop in machine down-time.



MACHINABILITY STEPPED-UP 27% on this forged fitting when manufacturer switched to hot rolled Ledloy Grade A. Just one of many phenomenal case stories reported by producers of machined forgings.

15,000 HOLES must be drilled in this steam condenser baffle plate. Changing from non-leaded steel to Ledloy cut drill and ream time, resulted in truer, smoother holes, with no sacrifice in strength or other properties.

If you make screw machine products or machined forgings, or if your product requires drilling or machining it will pay you to get all the facts about Ledloy. Ask your cold drawer or jobber. Or write for our interesting booklet on "Properties of Leaded Steels".

**registered trade name of Inland Steel Company, leaders in the development of leaded steels.*

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NEW *all-steel* ERIE

RIGIDROP

New design piston-lift gravity drop hammer with

New variable stroke control

More guiding surface for closer-tolerance forgings

Safety-streamlined, economical all steel construction

Experienced hammer operators will take quickly to the definite working advantages of this new Erie Rigidrop. It is a brand new concept in a simple-to-operate all-steel production hammer—striking more blows per minute, more easily, and with finer control than ever before realized. Certain shops will find this the most economical hammer they can use in their operations.

Most appreciated in Rigidrop's action is its ability to control stroke variation. This is not simply a short stroke feature, but a *new variable stroke control* allowing you to get *all the range* of strokes between the conventional short and long. Its treadle operates as simply as the accelerator on your automobile—for short fast blows, just press lightly; for longer strokes, apply more foot pressure as desired. And . . . your operator can instantly shift from short strokes to longer, and shift back again just as quickly.

There are many more features of the Rigidrop which will appeal to cost-conscious shops. We'll gladly have an experienced Erie Foundry representative call on you to explain its application—just ask.

Now available in sizes 1500 thru 5000 lbs., inclusive

40% more guiding surface—New Erie guide arrangement provides more accurate guiding of ram and continued maintenance of die adjustment.

Adjustable guides—Guide-Ram adjustments easily made from front and back of Rigidrop at close-to-floor level. Ram can be removed from the hammer at die level, without jacking.

Safety designed throughout—No loose linkage, no overhanging parts on the front of the Rigidrop. An air cushion head provides added protection if the hammer is overstroked.

Built-in inching mechanism—For easy die setups.

Better clamping system—Clamp faces are directly opposite one another to give positive clamping action without bending the rod.

Minimum down time—Never any board replacements.

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NEW "Unionmelt" Welding Assemblies

for greater job versatility- performance dependability

Versatility and dependability are yours at an all time high in an improved new line of UNIONMELT welding assemblies . . . These units embody the greatest variety of machine combinations, job applications, and design features ever offered for submerged arc welding.

Wire feed units are simply constructed and are highly efficient . . . Identical mounting dimensions for heads, brackets, and slides allow for any number of desired assembly combinations.

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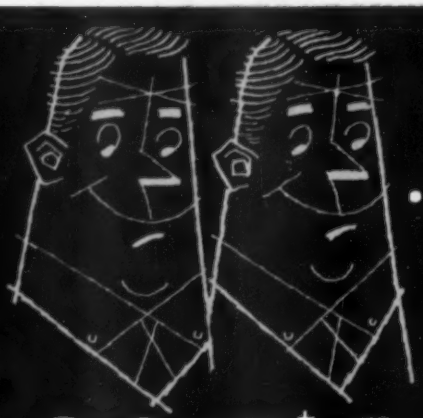
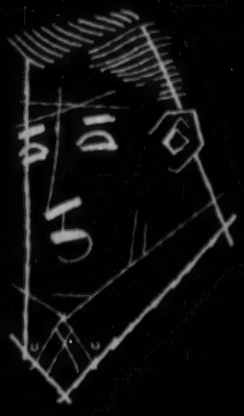


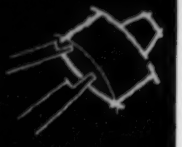
...two heads...

...are better than one...



...one head for this...

...the other head for this



result...

...speed

...accuracy

...finish

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KUMMER

SPECIFICATIONS
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Dual-headed Semi-Automatic LATHE
Maximum turning diameter 3 5/32"
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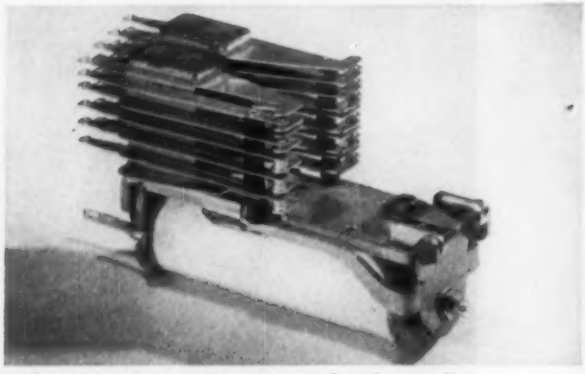
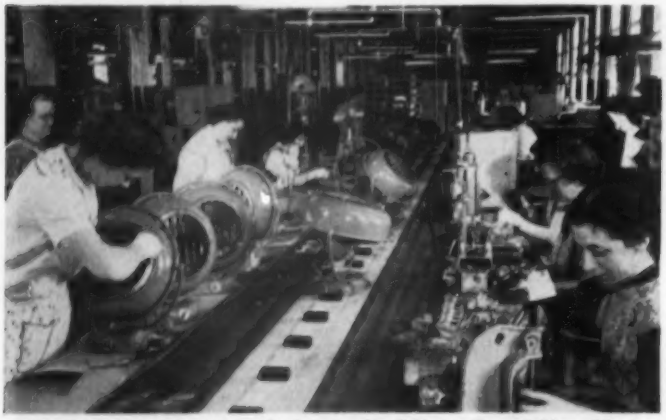
Why Design Engineers Prefer PHILLIPS CROSS RECESSED HEAD SCREWS

INCREASED SALES APPEAL is just one benefit credited to Phillips screws by Portable Electric Tools, Inc., prominent Chicago manufacturers. Engineer Shoemaker of this firm says, "Phillips screws reduce rejects, upgrade production, give a tighter bond and add a definite sales advantage to our finished products."



IN A MILLION ELECTRICAL RELAYS produced annually by the C. P. Clare Co. of Chicago, Phillips head screws aid product performance as well as production. Clare officials state that Phillips screws, besides speeding assemblies and improving product appearance, have the prolonged holding power vital to efficient relay operation.



"WINDSTREAMER" FANS, made by A. C. Gilbert Co. of New Haven, Conn., are protected against damage in assembly by the use of Phillips head screws. "For tight fit, neat appearance and production efficiency, Phillips screws are unequalled," is the report from this leading manufacturer of toys and electrical appliances.

MANUFACTURERS OF PHILLIPS CROSS-RECESSED-HEAD SCREWS

THE FASTENERS OF TODAY...
AND OF THE FUTURE
X marks the spot
the mark of extra quality

Pledged to highest standards...

The Phillips Screw manufacturers listed here cooperate to turn out a uniformly high standard of quality. As sponsors of the Phillips Cross-Recessed-Head Standards Committee they adhere to the established dimensional standards, gauges, and gauging methods which will best serve industry.

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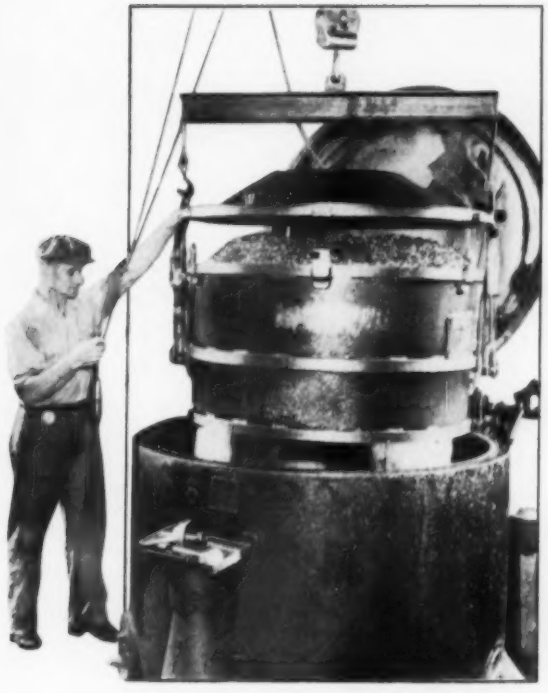
WHEN THE CHIPS ARE DOWN...



Every drop of cutting oil in your chips and turnings costs you money. Every drop adhering to the chips after drying, is wasted money.

De Laval Centrifugal Chip Oil Extractors salvage the maximum amount of oil. They speed up the salvaging process . . . operate free of gyration under normal loads . . . are easy to load and unload . . . are built to take it.

De Laval not only makes Chip Oil Extractors in various types and sizes to meet each set of conditions, but De Laval Engineers are available to advise you on every phase of chip oil reclamation, including the handling of dried chips.

Put your chip salvage up to De Laval today — as many other metal working plants have already done.

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THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York • 427 Randolph St., Chicago 6 • DE LAVAL PACIFIC CO. 201 E. Millbrae Ave., Millbrae, Calif.

ECONOMY Automatic Pointing Machines

Save Time and Money!

TYPE 3300

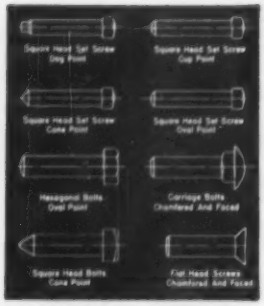
ECONOMY Automatic Pointing Machines are hopper fed and automatic in operation. These features enable operator to run several machines resulting in greater productivity and lower costs.

These Automatic Pointers are available in two sizes—Type 3300 for uniformly pointing bolts and screws to 3/8" diameter and 3/4" to 3-1/2" in length, the type 4600 for pointing bolts and cap screws 1/4" to 3/4" diameter and 1" to 6" in length. A single machine will handle all types of points on many types of bolts and cap screws.

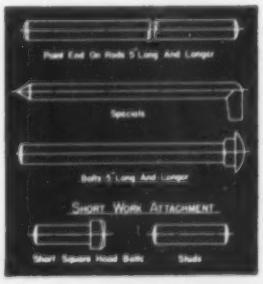
Production rates of the type 3300 vary infinitely from 2,000 to 6,000 finished parts per hour and on the type 4600 from 1800 to 5400 per hour.

Also available is the type "P" Semi-Automatic Pointing Machine for pointing bolts, cap screws, studs and rods 1/4" to 1-1/2" diameter, 5" or more in length. Production rates up to 2,000 pieces per hour make it a valuable secondary machine for short runs.

Consult ECONOMY on low cost, high production Bolt and Screw Pointing operations.


Square Head Set Screw Dog Point
Square Head Set Screw Cup Point
Square Head Set Screw Cone Point
Square Head Set Screw Oval Point
Hexagonal Bolts Oval Point
Carriage Bolts Chamfered And Faced
Square Head Bolts Cone Point
Flat Head Screws Chamfered And Faced

Typical parts machined on the TYPE 3300



Typical operations performed on TYPE "P" Semi-Automatic Pointing Machines

THE ECONOMY LINE

Automatic Shaving Machines
Automatic Pointing & Shaving Machines
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THE ECONOMY ENGINEERING CO.

WILLOUGHBY, OHIO

Designers and Manufacturers of Secondary Operation Machines since 1915

Handle your small part precision JIG BORING on the LINLEY JIG BORER

Why tie up your big, costly jig borers on small work when you can get maximum utility at less cost per hour on a machine exactly fitted to your work. Put your small work on the LINLEY where it belongs and reserve your large machines for large work, where large work belongs. You'll save money this way.

SPECIFICATIONS

Table Movement: 6" x 10" — Table Size: 7" x 17½"

Complete details sent promptly on request

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Cut die design work in HALF on many jobs!

Save time with these hundreds of successful designs for cold pressworking

This practical guide not only shows how to make *better, more efficient* designs, but also presents hundreds of *actual, proven* die designs for cold press-working of sheet or strip metal. Representing best practice of many ASTE members, these designs can save you more than 50% work and time on many jobs. You will find them *easy* to adapt to your own needs. The Handbook provides a wealth of data on such subjects as design of stampings, die sets and components, press feeding and unloading equipment, die and stamping materials, etc.

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American Society of Tool Engineers

FRANK W. WILSON,
Editor-in-Chief
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695 illustrations, $14.50
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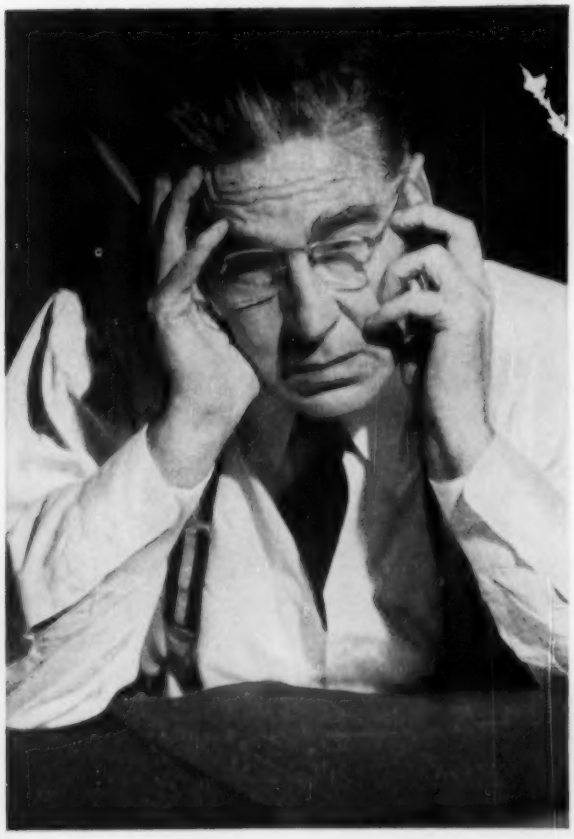

send it out to CDT

There is no faster, more reliable way to get help with difficult tooling problems than to send it to Columbus Die-Tool. Backed by 50 years of experience, CDT has three basic objectives when designing and building tools, jigs, fixtures or special machinery.

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These and other benefits are reasons why so many of the nation's leading manufacturers regularly avail themselves of the specialized services of Columbus Die-Tool. Perhaps we can solve your tooling problem and help you make your product . . . better, for less.

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Weldon standard holders accommodate all sizes.

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The only major improvement in coolants in 50 years

Johnson's metalworking fluids came in with automation. They are as efficient and advanced as 1956 high-speed machine tools. They bring you the first major improvement in coolants since 1900—*the use of wax and wax-type synthetics.*

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Pictured below is Johnson's J-Cool, one of a complete line of modern coolants for today's high-speed production.

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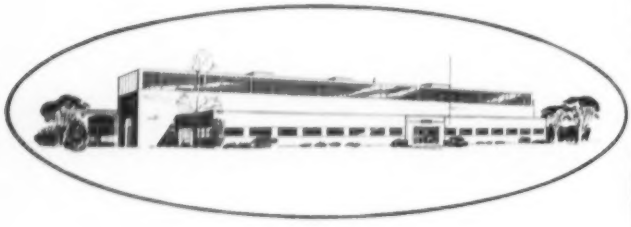
headquarters for metal forming...

"Complete Metal Forming Service" is a byword at the Cyril Bath Company. Recognized leaders for over 40 years, Bath manufactures a complete line of Power Presses, Press Type Brakes, Tangent Benders, Multi-Form Sequence Presses and Radial Draw Forming Machines.

If you need production, the Metal Form Division will produce your parts to specification. Its Engineering Department and complete plant facilities are at your disposal.

Inquire today about Bath's complete service. Your inquiry, prints or samples of your specific requirements will receive prompt attention.



Send today for literature on Bath products or service. Catalogs on Stock Press Brake Dies, Power Press Brakes, Bath Press Type Brakes, Tangent Bending Sequence Presses, Aircraft Contract Forming or Stretch, Compression and Radial Draw Forming are yours for the asking. They contain a wealth of information on metal forming ... from simple blanking and bending to forming of complex parts.

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Manufacturers of Radial Draw Formers • Dies • Tools
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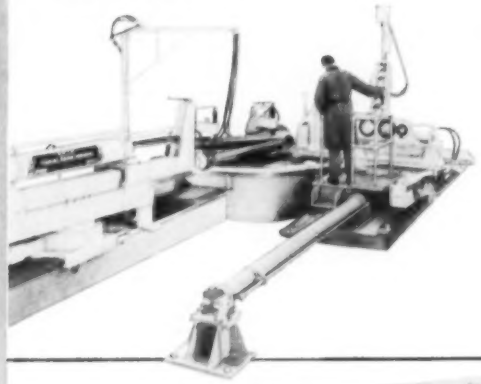
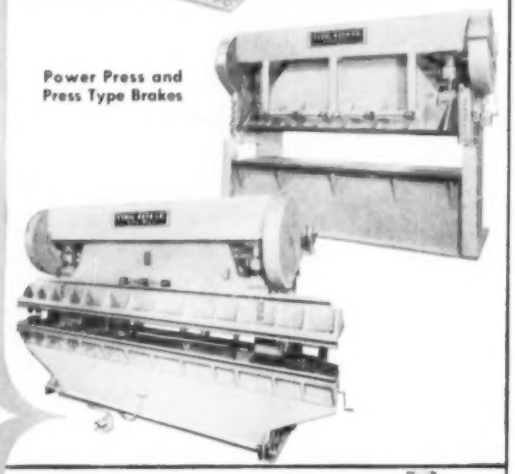


Power Press and Press Type Brakes



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P&H Welding Positioners give you

EXTRA CAPACITY

for BIGGER PRODUCTION SAVINGS

Exclusive P&H design features permit handling greater positioning loads for every dollar you invest

Positioned welding is *downhand* welding that permits your weldors to use larger, hotter rods for higher deposition rates. This extra welding speed and the savings in handling of weldments cut welding costs as much as 50%.

When economies like this are possible, it pays to get P&H positioners. Size for size, they can handle the widest range of weldments — give you the greatest capacity per dollar invested. The chart below compares the load capacities of positioners in the 3000-lb. class and proves the extra value of P&H.

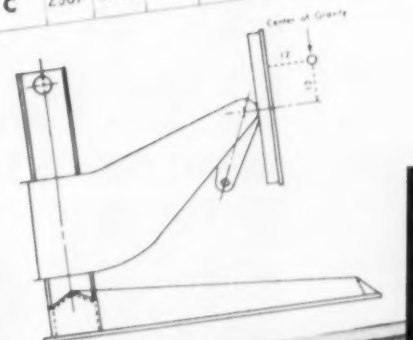
This extra-capacity advantage is found in all sizes of P&H positioners. A free load-capacity table is available to help you select the model best suited to your needs Just send in the coupon.

HARNISCHFEGER
MILWAUKEE 46, WISCONSIN

3000-LB. MODELS
LOAD CAPACITY COMPARISON CHART

Capacity Shown Below at 12" off center of Rotation and Distances of Center of Gravity of Load from Table.

Positioner	12"	18"	24"	30"	36"	42"	48"	54"	60"
P&H	**3000**	**2510**	**2160**	**1900**	**1690**	**1520**	**1390**	**1270**	**1180**
A	3000	2000	1500	1200	1000	—	—	—	—
B	3000	2250	1800	1500	—	—	—	—	—
C	2987	2187	1725	1424	1212	1056	935	839	760



I'M SMOOTHARC SCOTTY...and I'm always looking for ways to save money. That's why I like the extra capacity of P&H positioners. Our FREE load-capacity table will show you why.

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P&H **HARNISCHFEGER CORPORATION**
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Attention: W. R. Stephens, Sales Manager

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Company _____

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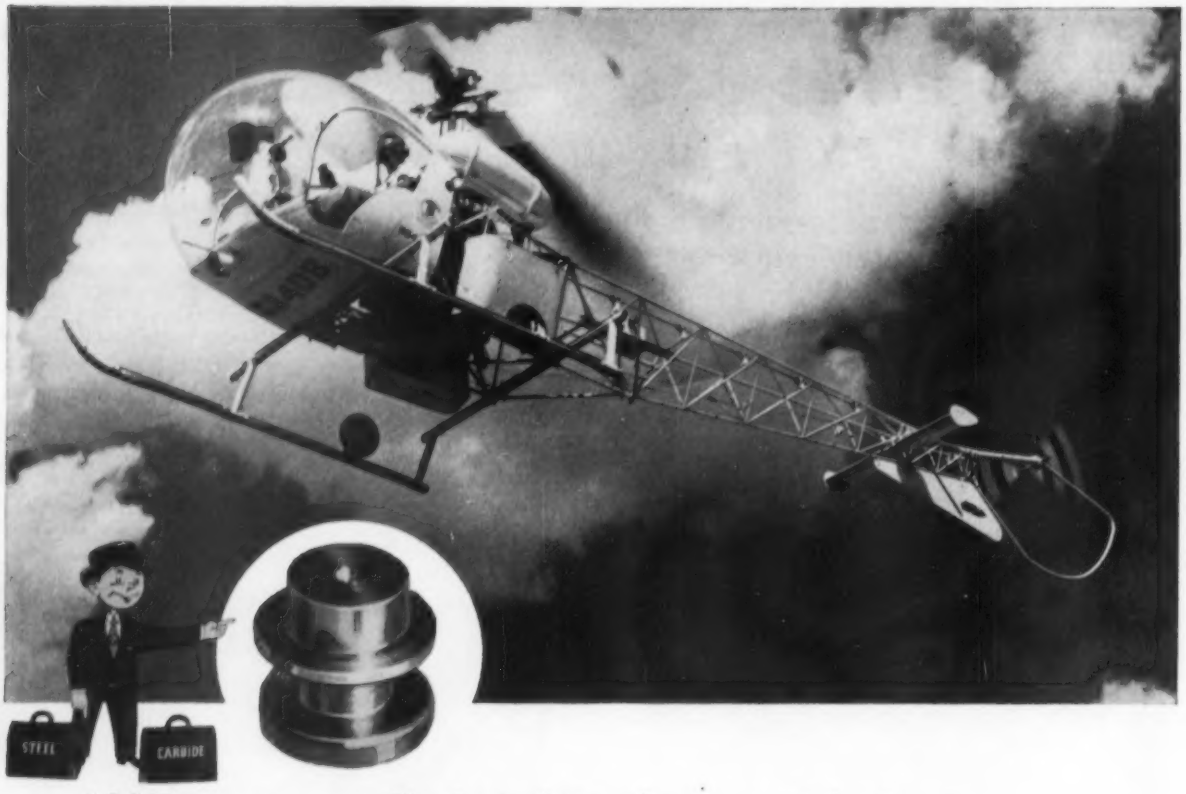
P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY LTD., 455 King Street West • Toronto, Ontario, Canada

"Mission accomplished" at Bell Aircraft...with FIRTHITE TXH



133% more needle bearing pins per grind

Down Fort Worth way at famous Bell Aircraft Corporation, they made production tests on the *new* FIRTHITE TXH Carbide . . . turning and facing needle bearing pins from SAE 4140 steel.

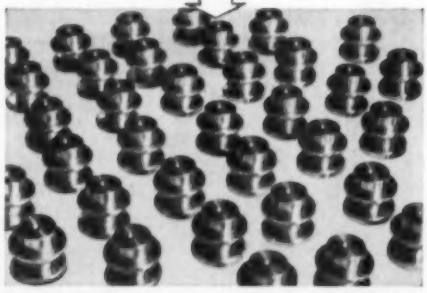
The results speak for themselves:

- 133% more bearing pins per grind.
- More than twice as many pieces per grind as nearest premium grade.
- Seven times more pieces per grind than two other competitive grades.
- Only .007 stock removed to resharpen compared with .025—.035 for competitive grades.

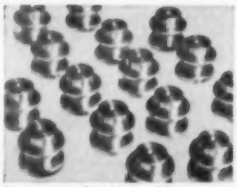
Truly this test proves, as do others all over the country, that FIRTHITE TXH is easily the outstanding carbide in its field . . . a *premium grade* at *no* premium price.

Yes, FIRTHITE TXH is a completely *new* carbide concept . . . a combination of materials and processes designed specifically to do heavy-duty, high-production cutting operations better than they have ever been done before!

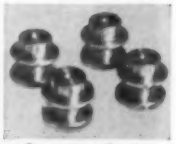
You, too, can make important savings, and increase production with TXH. It's available *now* in all standard tips and tools. Try it today.



FIRTHITE TXH—35 PER GRIND



Competitive Grade A—15 per grind



Competitive Grades B & C—4-5 per grind

R 316

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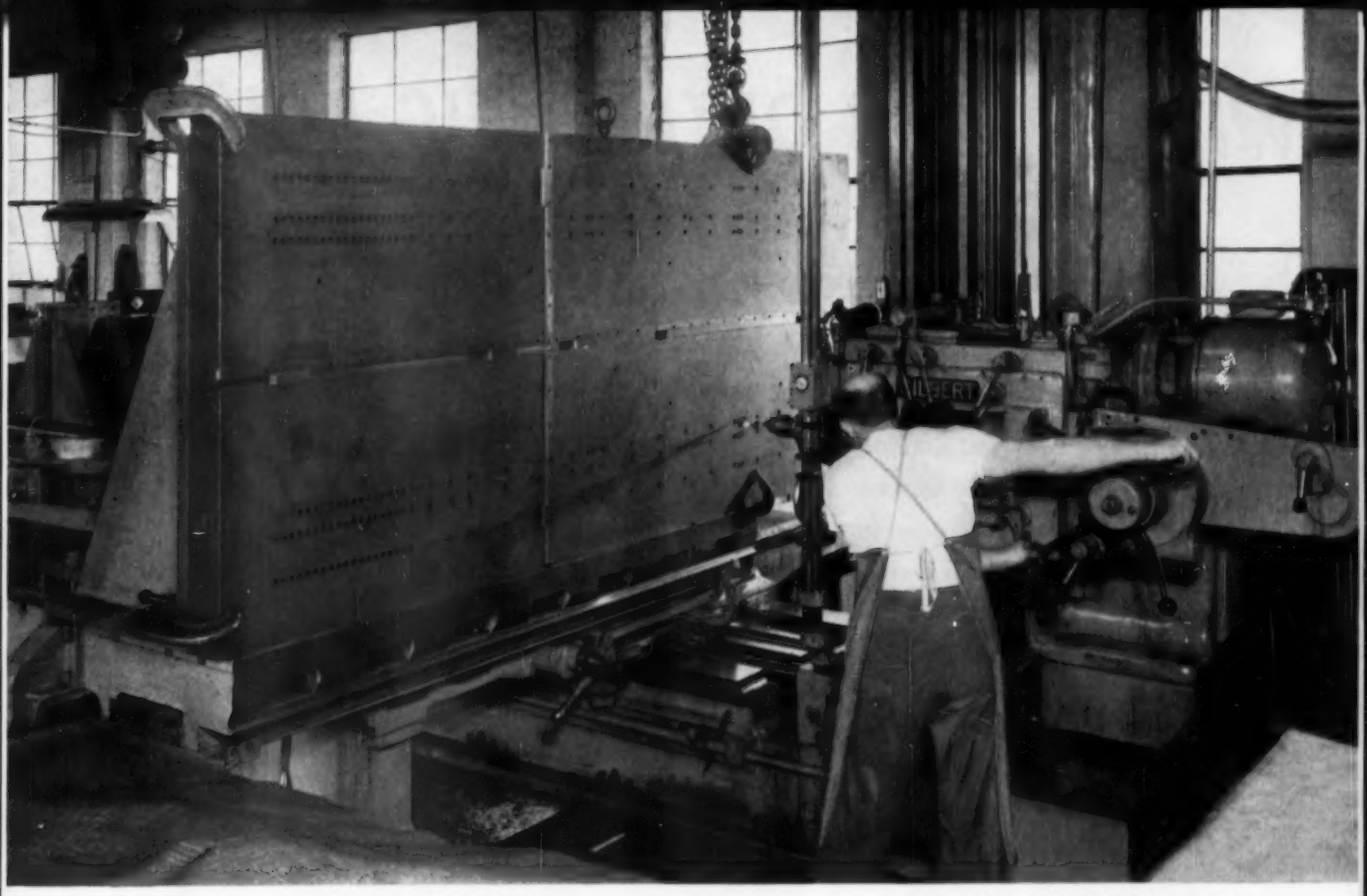


courtesy Linden Tool and Manufacturing Co.

Linden's Gilbert holds 235 holes on location ±.0007″

This is the kind of job you can handle profitably if you have a good operator and a Cincinnati Gilbert horizontal boring mill.

The piece is a 50″ by 120″ base for special indexing. Linden Tool and Manufacturing Co., Dayton, O., performs these operations:

1. Mill keyways 9/32″ deep, full length and width of the base. Width of each keyway is 1.000″ ± .001″.

2. Drill 235 indexing holes, .625″ diameter. These holes must be held on location within ± .0007″. In addition, center lines of the holes (horizontal and vertical) must be parallel and square with the key-ways within .001″.

This job is another demonstration of the exceptional rigidity of Gilbert boring mills. Extended table and saddle supports help to maintain accuracy and handle the workpiece. Linden Tool and Manufacturing Company uses two Gilberts to produce a broad range of quality work for its Dayton area customers.

Gilbert boring mills are built as both Table and Floor types, with spindle diameters of 3½″, 3¾″, 4″, and 5″. A selection of column heights, bed lengths, table sizes, and workholding units makes them easily adaptable to your requirements. Add to your work capacity—and your machining dollars—by getting a proposal from Gilbert now.

The Cincinnati Gilbert Machine Tool Co.
3340 Beekman Street, Cincinnati 23, Ohio

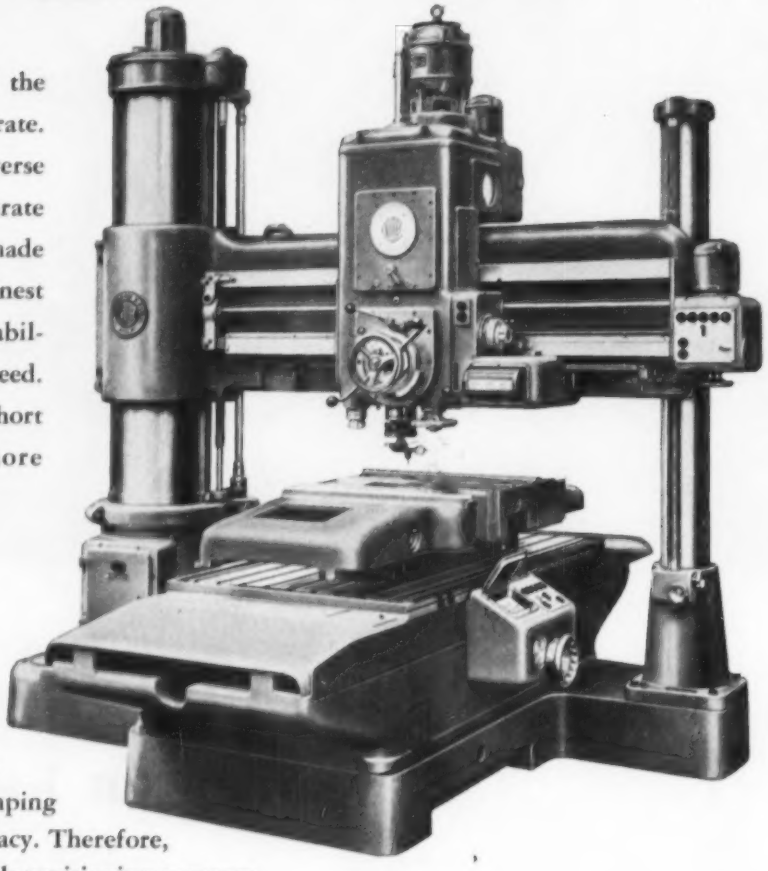
Low-cost financing plan—6% simple interest (3% add on), up to 5 years to pay—makes your purchase of Gilbert equipment immediately feasible. Subject to change.

those who buy Gilbert buy **GILBERT** *again*

WITH A KOLB OPTICAL JIG BORER

YOU CAN POSITION A WORKPIECE TO WITHIN .00005" IN A FEW SECONDS

Positioning a workpiece on the Kolb jig borer is fast and accurate. It's fast because of rapid traverse with adjustable stops—it's accurate because the optical system is made by Leitz, one of Germany's finest optical manufacturers. Repeatability of the coordinates is guaranteed. By eliminating costly jigs, short run jobs can be handled more profitably.



- Shock and distortion-free electro-hydraulic clamping does not impair accuracy. Therefore, reading accuracy equals positioning accuracy. Signal lights indicate if head and table are clamped or unclamped.
- Convenient pushbutton control—preselection of 18 feeds and 36 speeds.
- An excellent machine for drilling, boring, reaming, tapping and milling as well as precision measuring.
- Optical system has a magnification of 1:100—five inches on the focusing screen is equivalent to a movement of 0.05 inches along the coordinate.
- Working surface of table 69x39", clearance between columns 73", maximum distance between spindle and table 40".

Write for more information.

COSA — *nationwide sales and service of precision machine tools—from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

IN CANADA contact COSA CORPORATION OF CANADA LTD., 1160 Lakeshore Road, Long Branch, Toronto 14, Ontario

WHO EVER HEARD OF AN OILER AT A BOARD OF DIRECTORS MEETING?

It's not very likely . . . but, if an oiler ever *should* attend a board meeting he might tell management some things they should know. He might tell of problems in keeping vital machines lubricated . . . of keeping them running at peak efficiency. He might tell of lost manhours and machine downtime. He might tell of hidden losses that executives would recognize as symptoms of old-fashioned lubrication. Maybe *your* oiler could tell you of losses in *your* plant. Think it over! And if you decide that your production costs are too high because of "lube" problems, you might find it interesting to learn how Alemite can help you.

Modern Automatic Alemite Lubrication. A Mid-west manufacturer cut costs $20,000 a year. A paper company saved $3,000 a month. And a textile firm ended substantial production wastes.

The answer: Modern Alemite systems that automatically feed exactly the right amount of oil or grease to every lubrication point . . . that keep machines running longer with less downtime . . . that eliminate oil waste and product spoilage.

Take a look around your shop. Ask yourself if an Alemite lubrication expert might not recommend an inexpensive solution to your lubrication problems. Wherever you are, there is an Alemite representative ready to serve you.

ALEMITE

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FREE! NEW BOOKLET!

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Gentlemen: Please send me my free copy of "An Executive's Approach to Lubrication Problems." No obligation, of course.

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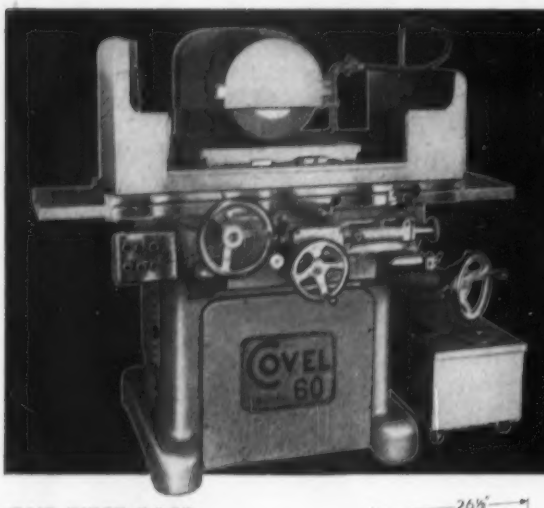

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COVEL HYDRAULIC SURFACE GRINDERS

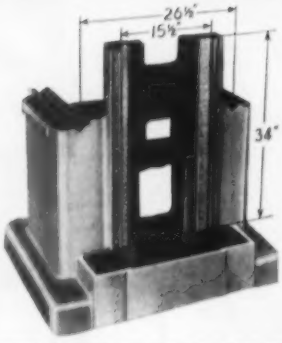
Available in three sizes

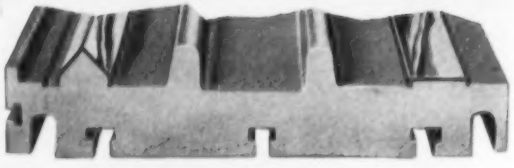
	No. 20	No. 35	No. 60
Work capacity	6"x18"x12"	8"x24"x11"	14"x24"x15"
Grinding wheel	10"x¾"x3"	12"x¾"x3"	14"x1"x3"
Spindle motor, HP	1½	2	3

ONE-PIECE BASE

Vertical and cross ways are integral for permanent alignment.

Length of vertical ways.....34"
Width of vertical ways.....15½"
Distance between double V cross ways.....26½"
Weight of base, 1570 lbs.





HARD CHROME TABLE WAYS

Special Covel plating process applies hard chrome surface direct to the close grain, alloy cast iron surface of V and flat table ways *after* they are precision hand scraped from a master plate. Tables in service for over five years show but slight wear, no flaking. Available at extra cost.

HARDENED AND GROUND LEAD SCREWS

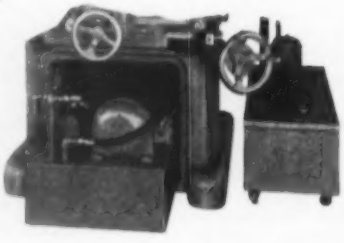
Made of best quality tool steel, Covel cross feed and elevating screws are hardened and ground to insure long-lived precision operation.

ELEVATING HAND WHEEL

Located *below* the level of the table where the operator can read the graduations easily and keep an eye on the work.

CLOSED HYDRAULIC SYSTEM

Prevents dirt or coolant from contaminating the hydraulic oil. Covel low pressure system throughout. 15 gallon oil reservoir located in base of machine slides out for easy maintenance.



THREE SPINDLE SPEEDS

This Covel cost reducer makes it easy to obtain proper peripheral speed for the grinding wheel even after wheel has been worn down. Permits use of worn wheels without loss of grinding efficiency. Cartridge-type sealed-for-life anti-friction spindle, V-belt driven.

These features, plus many others, are reasons why Covel is rated "tops" in surface grinders. Write or 'phone for full information.

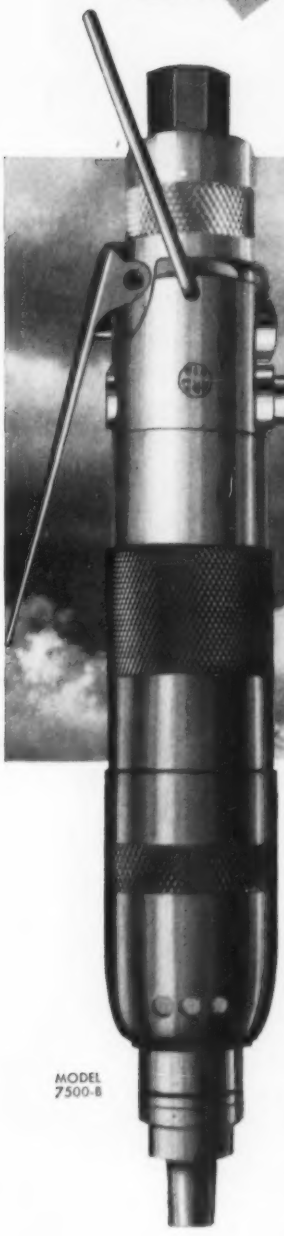
COVEL PRECISION GRINDERS

HYDRAULIC & HAND FEED SURFACE GRINDERS
UNIVERSAL CUTTER & TOOL GRINDERS • DRILL GRINDERS

DEPT. AM-216
BENTON HARBOR, MICHIGAN
WAlnut 6-6157

QUIET

as a gentle breeze!



MODEL 7500-B

New ARO
DULCETONE SCREWDRIVER

"Whispers while it works"

Reduce noise to a whisper in your assembly operations . . . cut down operator fatigue . . . use ARO Dulcetone Air Screwdrivers! This slim compact tool runs with a *quiet gentle* exhaust. Light weight . . . 1800 r.p.m. Capacity No. 8 nuts and machine screws. Dulcetone Screwdrivers now offered as standard tools . . . immediate delivery. Ask your ARO Distributor for a demonstration.

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ARO® AIR TOOLS
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MORE PROFITS PER HOLE

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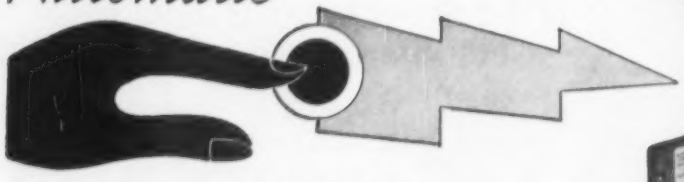

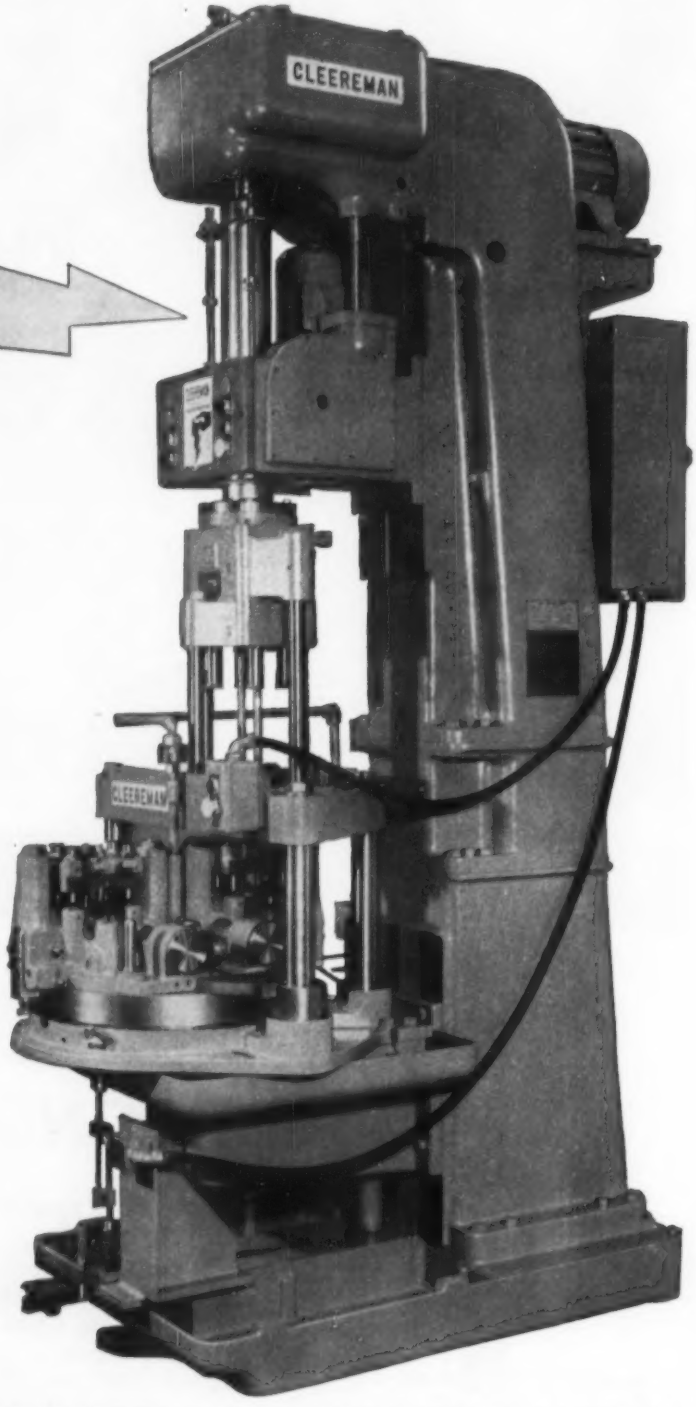

More Holes per Labor $ $ $

An automatic cycle that sets the production pace. Push button control leaves the operator free to handle piece parts easier and faster.

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Flash-Butt Welding

How to Use It to Help Put the Profits Back Into Manufacturing

What is Flash-butt Welding?

Flash-butt welding is a resistance welding process for end to end joining of rods, tubes, bars, forgings, fittings, etc., to achieve the greatest possible strength. It is accomplished by positioning the pieces to be joined with clamping electrodes so that there is initially light contact between abutting edges (Fig. 1).

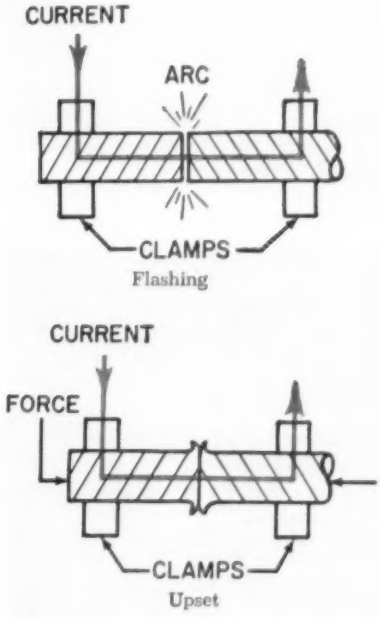

Fig. 1. Flash-butt welding process.

Introduction of the current causes flashing which generates great heat. As the metal is burned away the pieces are moved together in an accelerating motion. Thus, uniform flashing action is maintained for the most efficient heating process. When the inner faces obtain the proper temperature, they are forced together under high pressure and the current is cut off. The impurities (oxides, slag, etc.) formed during flashing are forced out in the upset action leaving pure base metal to form a high strength bond (Fig. 3).

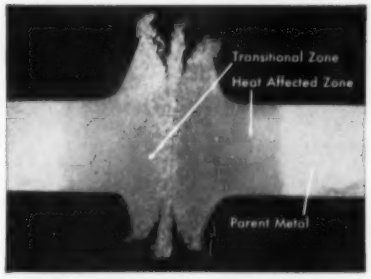

Fig. 2. Macrograph of 2" O.D. x .095" wall of 4140 alloy steel tubing flash-butt welded on a Sciaky Type BMW. 3-400 machine.

Advantages of Flash-butt Welding

Flash-butt welding offers a 100% strength factor compared to 80% strength factor for flame and arc welds. Further, no extra material such as gas, rod, or flux is required. *The material itself forms the weld.*

Flash-butt welding has low power demand and power consumption. Higher production speeds are more readily achieved with this process than with any other fastening method. The localized heat minimizes part distortion. Generally, no special preparation of the weld surfaces is required.

Simplicity and effectiveness of the Sciaky Flash-butt weld technique reduces multi-step fastening operations to just one. One operator (not skilled) can consistently produce high quality welds.

Dissimilar metals with widely varying melting temperatures are easily flash-butt welded.

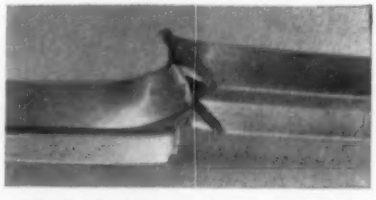

Fig. 3. Destruction test on extruded aluminum miter joint. Note that failure is in parent metal, not in the weld.

How to Use Flash-butt Welding

Whenever ideal flash-butt welds are required, the size and shape of the parts to be welded should be identical. However, a maximum of 15% variation in end dimension is usually permissible for commercial usage. New applications for this process are opening up every day. Often little, or no change in existing design allows conversion to high production flash-butt welding.

New Research Center for Your Fastening Problems

Sciaky's new three-quarter million dollar Research Center is equipped with the most advanced resistance welding machines, testing instruments, and trained personnel. The entire facility is devoted to solving *your* joining problems and advancing the application and development of resistance welding. The Research Center invites *you* to submit your fastening problems.

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Write today on your company letterhead describing your particular field of interest. We will send suitable back issues (as well as future issues) of our "Resistance Welding At Work" publication, showing typical joining problems solved by this method of fastening. All contain impressive case history examples of Sciaky basic thinking—resistance welding techniques designed to *put profits back into manufacturing.*

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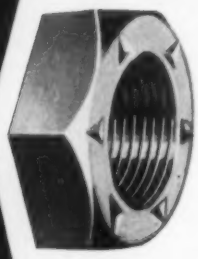

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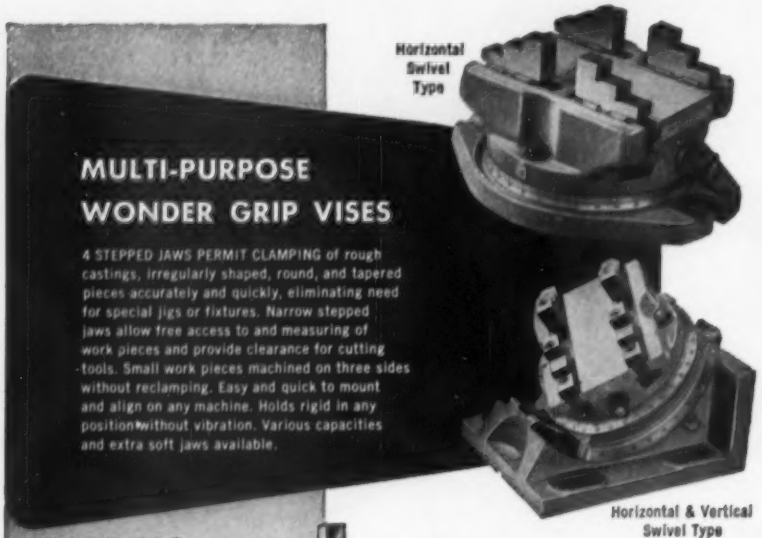

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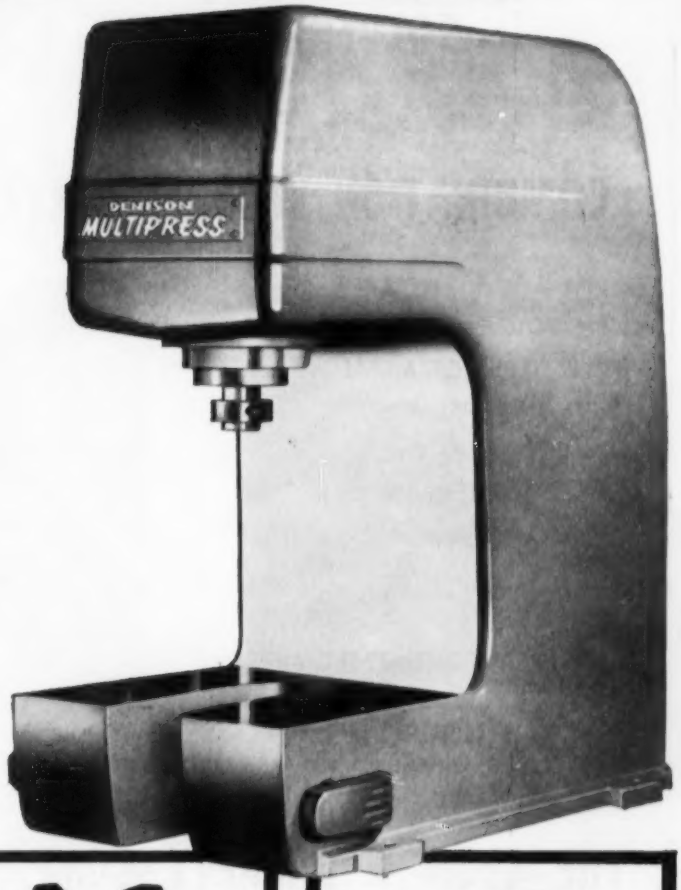

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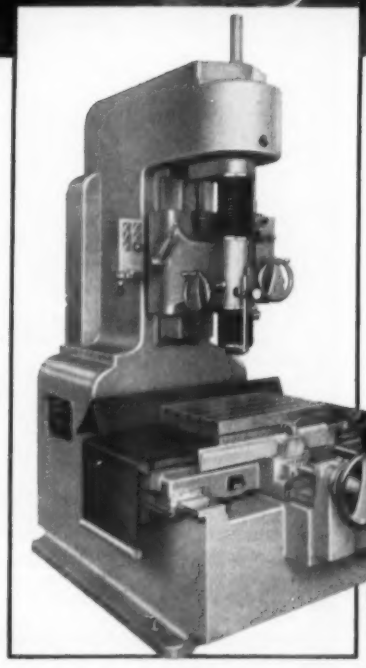

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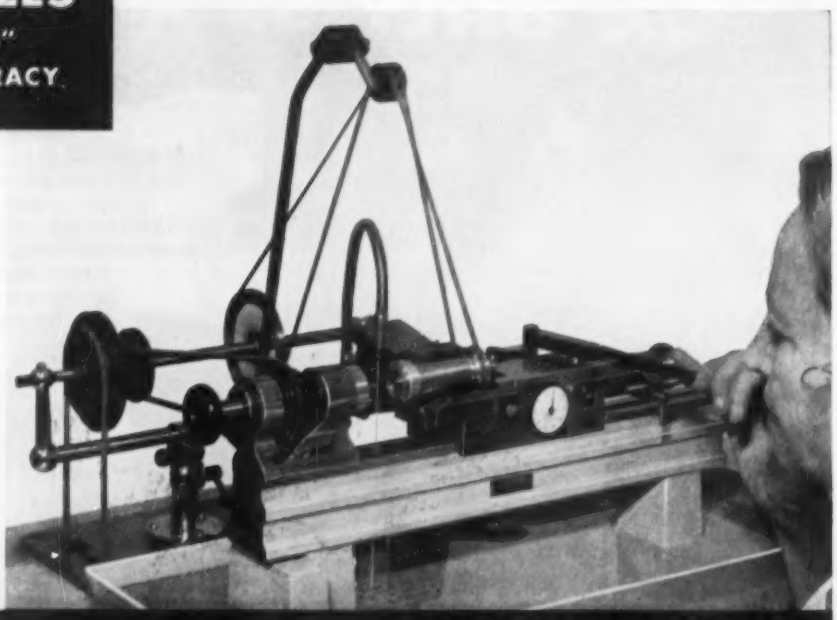

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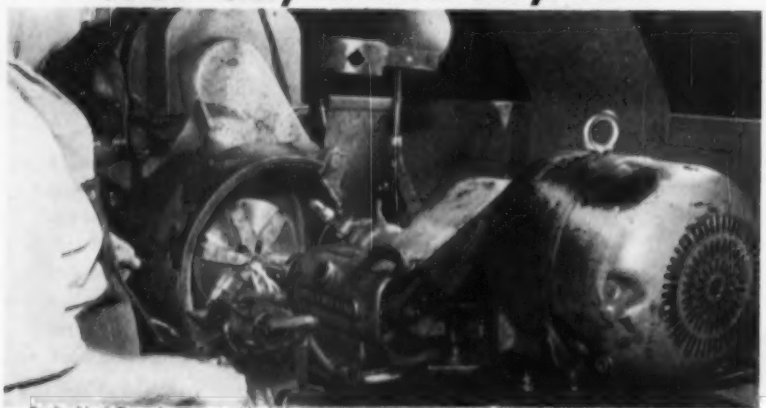

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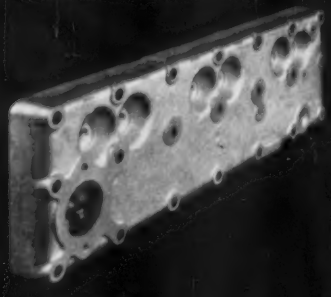

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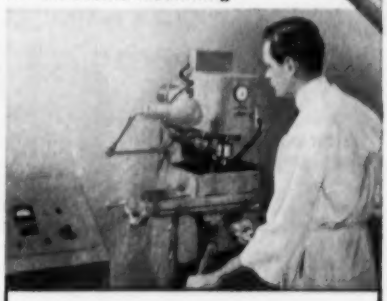

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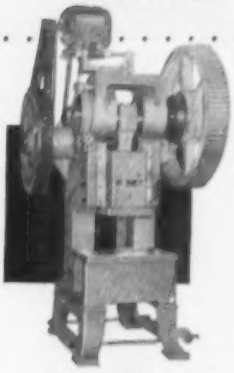

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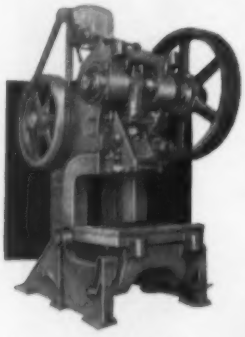

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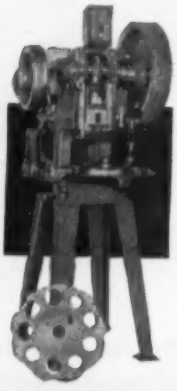

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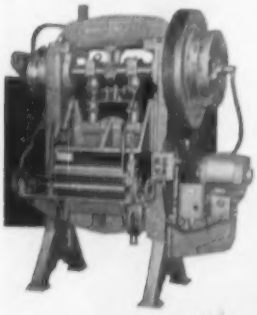

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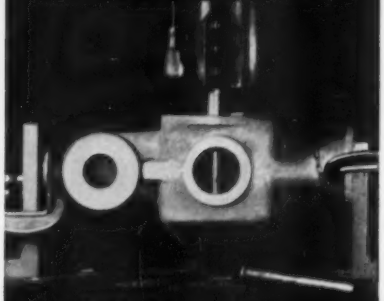

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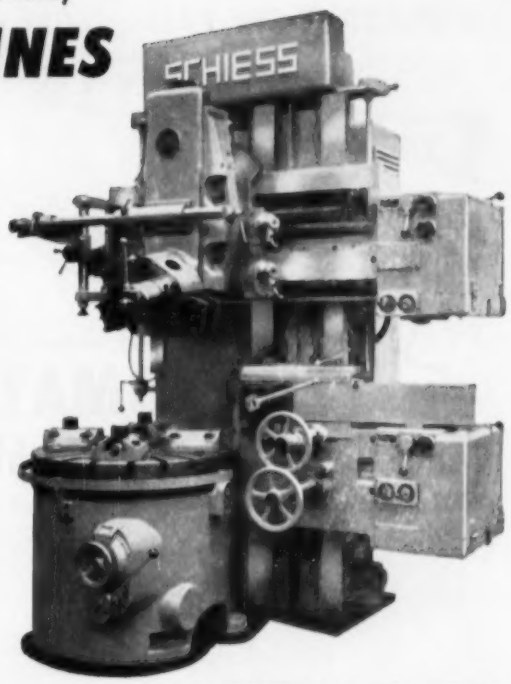

Model KE Single Column Vertical Turret Lathes with 40", 50" and 65" turning diameters for high-speed carbide machining.

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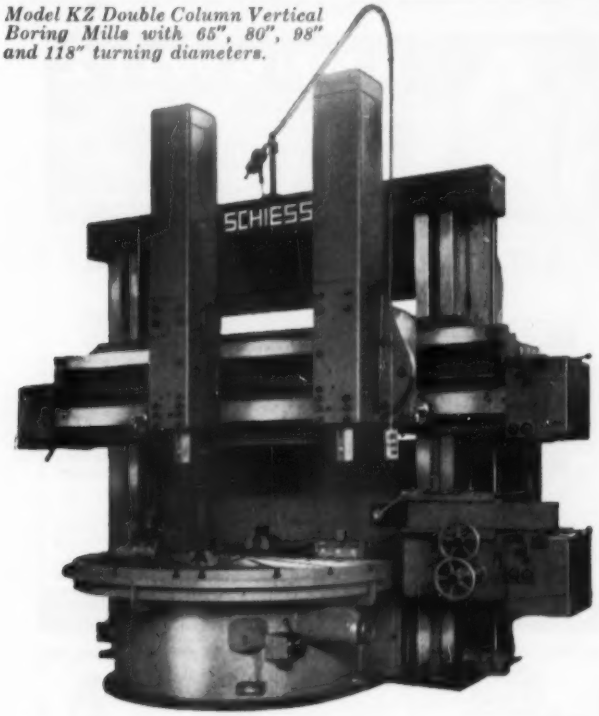

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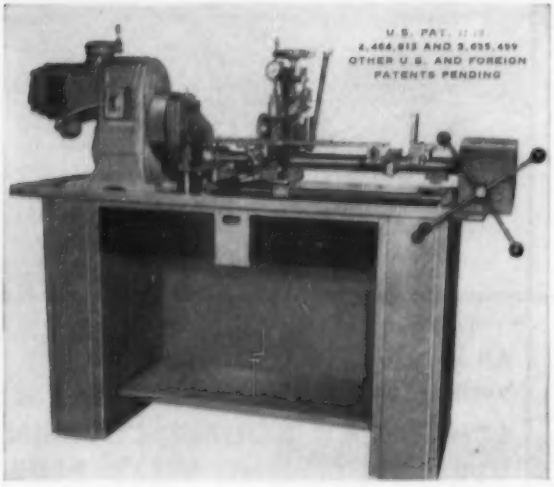

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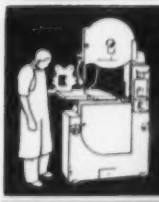

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Technical-ities

By John S. Davey

Coarse Threads Better Than Fine For Many Jobs

The load and stress concentrations on threads are lower in standard coarse thread fasteners than in fine threaded ones. Flank engagement is also greater because coarse threads are deeper. Except in such cases where fine adjustments are needed, coarse threads are, therefore, preferable to fine threads. They have greater resistance to stripping and, consequently, can be more highly torqued to make a stronger assembly.

PRODUCTION SAVINGS

Coarse thread fasteners tighten with only two-thirds the revolutions needed for fine threads. So your assembly time is faster, too. Coarse thread bolts enter nuts or mating holes with less tendency to cross thread when not truly positioned. In hard-to-reach areas, this ease of starting can often be your deciding factor. Bear in mind, too, that coarse threads need less "babying" in handling since they're less apt to be damaged.

All in all, coarse threaded standard fasteners prove best for an assembly because of their additional clamping strength—and best for the assembler because of their extra economy and production advantages.

Spin-Lock screws increase holding power by 20%

EXPERIENCE confirms that Spin-Lock screws hold tight under conditions of vibration or repeated heating and cooling. Their strong teeth have a ratchet action on the bearing surface—the acute angle lets the screw tighten fast and easily, until the teeth actually embed into the seat upon tightening, as shown in the sectional photomacrograph below. The almost vertical face of the teeth then resists counter-rotation and loosening. As a result, it takes about 20% more torque to loosen a Spin-Lock than to tighten it.

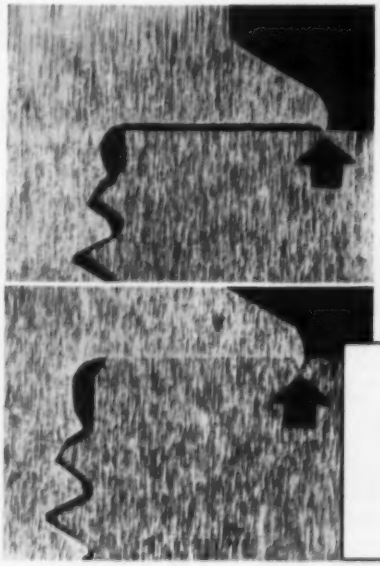
LOWER COST ASSEMBLY

Spin-Lock screws avoid need for washers or external locking devices. One-piece construction, they allow faster assembly and can be easily handled and driven in cramped spaces.

STRONGER ASSEMBLY

Heat treatment gives the teeth hardness and toughness. Spin-Lock screws can, therefore, be reused when removed with but slight loss in holding power. The extra strength also permits tighter fastening for a stronger assembly without risk of stripping threads.

Screws with hex, pan, truss and flat heads are available. See Sweet's Product Designers file or write Russell, Burdsall & Ward Bolt and Nut Company. Plants at: Port Chester, N.Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.



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A mechanical vibrating shaker naturally suffers severe abuse itself from vibration. One manufacturer of such machines used costly special fasteners and lock nuts to control tendency of the product to loosen up.

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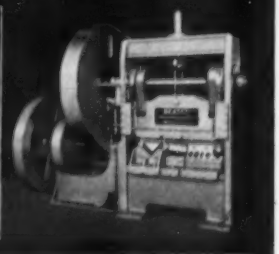

GUILLOTINE BEAM PUNCH (left) — Punches flanges and webs of beams. Requires less floor space, lower first cost and extreme rigidity for longer tool life. Full capacity loading and punching across face of ram. 150, 200 and 350 ton models. **GUILLOTINE BAR SHEAR** (right) — For production or "short order" shearing of rounds, squares, angles and bars, without changing tools. Cap. 43 to 300 ton.

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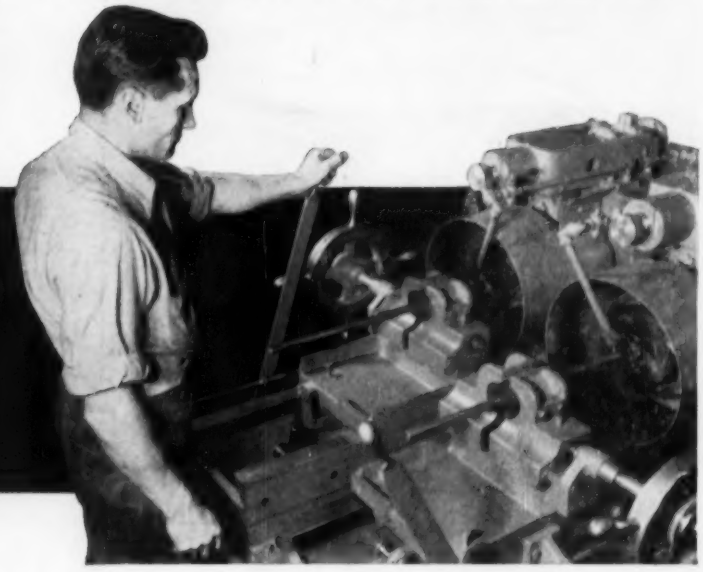
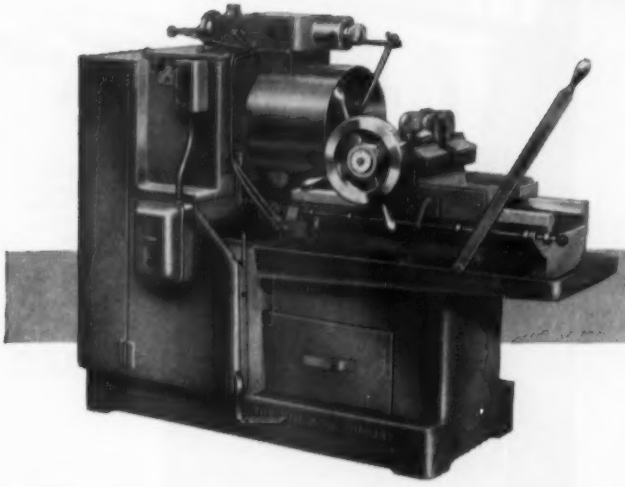


The ACME Model XLA Threader is a low cost, heavy duty threading machine designed for either maintenance work or for production operations when equipped with automatic features. The ACME XLA is built in single and double spindle design in sizes of 1", 1½", 2" and 2½" capacity.



ACME Model XLA Threaders can be equipped with either the "HILLCO" Tangential Die Head, for production work, or with the "ACME" Hob Type head for maintenance operations. This precision machine with it's amazing versatility is priced to fit YOUR budget.

Bulletin XLA gives complete details.

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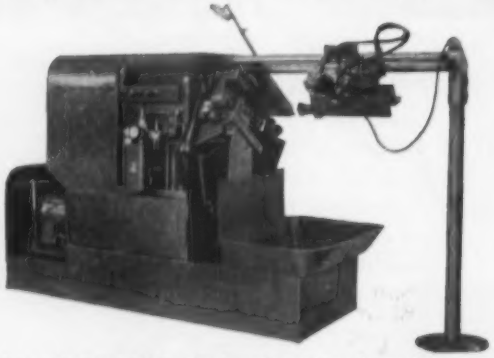

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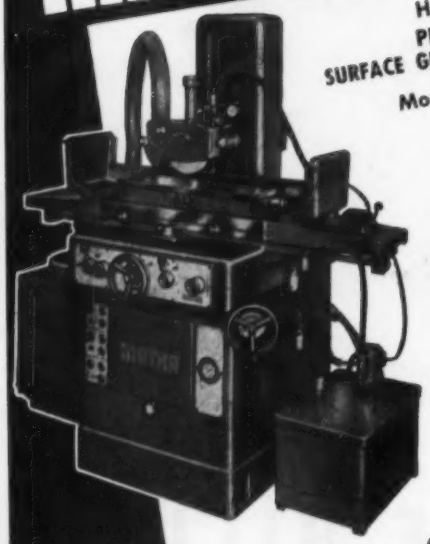

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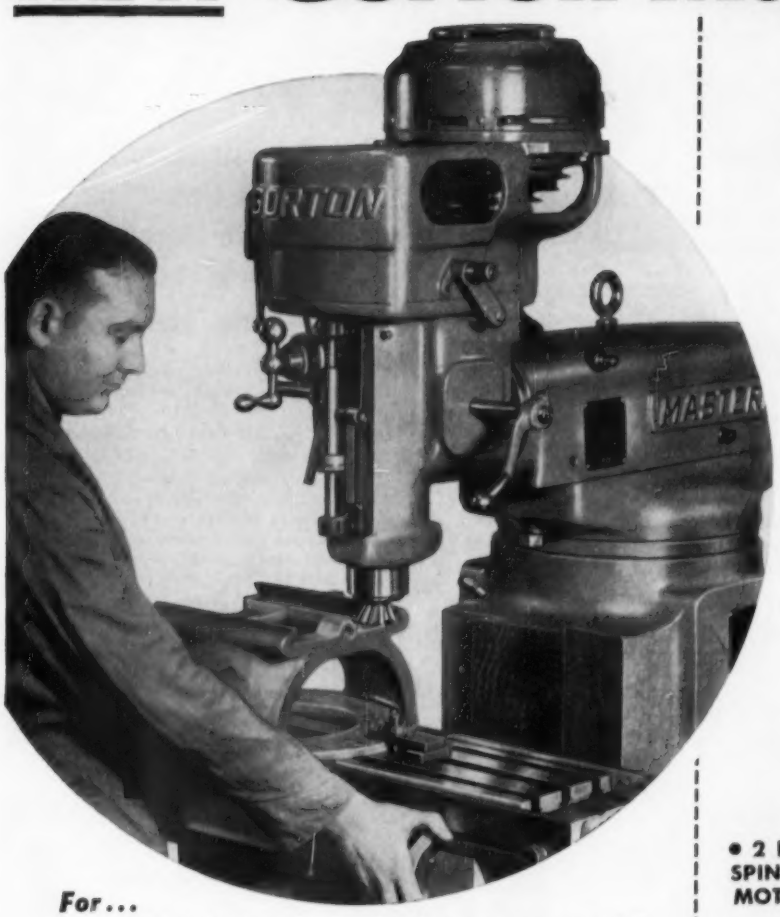

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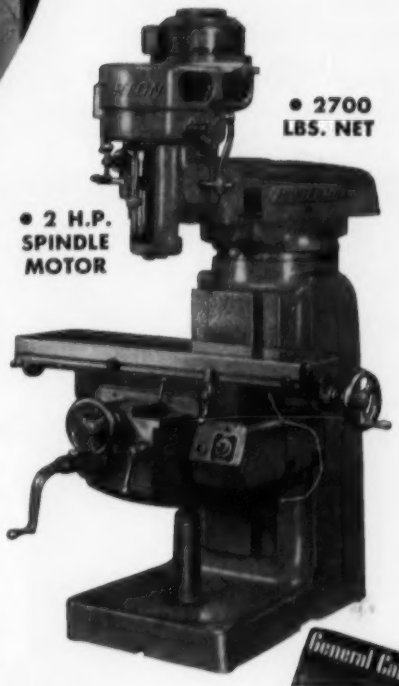

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Gaging . . .

the Surplus Machinery Market

New and much-needed service for its member dealers is the Machinery Dealers National Association's "Bought This Week for Sale" weekly newsletter. Purpose of the newsletter is to let other member dealers know what new machines you have on hand that you'd be willing to sell.

Idea behind the newsletter, according to MDNA Executive Director, is to increase members' immediate available inventory. It's done this way: each member sends in 10 or less 1-line descriptions of machines he has just purchased to MDNA's Washington headquarters. Then, every Monday morning, MDNA lists them alphabetically by firm name, planographs the list and sends it to members.

This provides an effective two-way service: (1) it gives all member dealers a much wider inventory to sell from, and (2) it gives the listed company a chance to move its newly acquired items fast, saving on storage and handling charges.

Well, it's no surprise to anyone that business is picking up all over the country—but, as one dealer puts it, in a way that's "nothing to write home about just yet."

Outlook for the just-started fourth quarter ranges anywhere from "mildly optimistic" (with fingers crossed) to "excellent prospects." We're more inclined to believe the latter, basing this opinion on current boom conditions in business generally, and in Metalworking particularly.

Demand is still tremendous for top-quality late-model machine tools and equipment, and for metal fabricating machinery. Fly-in-the-ointment is getting hold of the machines. Sellers generally are holding out for top prices, are shopping around for top money.

Small shops are getting to be big customers these days. What with capital goods and expansion money getting tighter and tighter, the small boys are willing to take what they can get and work it over themselves if necessary because of the increasing price differentials between A-1 machines and "as-is" ones.

Exception to this is the West Coast. Out San Francisco way, dealers report they're sitting pretty: summer doldrums are over, business is picking up fast, and the tight money situation hasn't even made a dent so far in demand for top-grade tools.

They report inventories are in good shape, and that they aren't backlogged at all on orders, except for an occasional standing order for specific types of quality machines. To get those items, Western dealers are looking to the East Coast, where prices generally are so much lower that even with added freight costs the Western dealer can make more profit on them.

Certain sizes of turret lathes and some tonnages of punch presses, for example, can be sold in the San Francisco and other West Coast areas faster than they can be uncrated. One reason: quite a few manufacturers will grab at any of these hard-to-get items even when they have no immediate use for them.

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BARBER COLEMAN Type S Hobber
FELLOWS 8M Red Liner Checker
FELLOWS 12" Helical & Spur Shaver
FELLOWS 64A Int. & Ext. Spur—1943
GLEASON 12" Straight Bevel Generator

GRINDERS, CYLINDRICAL
NORTON 14"x36" Type C Plain—1942
NORTON 10x36 Type C Semi-Auto.—1947
CINN. 8x18 Model ER Semi-Auto. — Filmatic

GRINDERS, SURFACE
COVEL #20 6x18 Hor. Hydr.
NORTON 6x18 Hor. Hydr.
NORTON 6x18 Vert. Hydr.
THOMPSON 12"x16"x60" Hydr.

LATHES, ENGINE
AMERICAN 36"x60" High Duty—1940
REED PRENTICE 20"x72" 16-Speed
SEBASTIAN 16x36 Model R Taper

LATHES, TURRET
B & O #7 2½" Chucking
B & O #2—1" Geared Electric Head
B & S #1 ⅝" Wire Feed Hand Screw
B & S #2 1" Wire Feed Hand Screw
GISHOLT #4—2" Bar & Chuck
GISHOLT #3 1½" Bar

MILLERS
B & S 2B Hi-Speed Plain
B & S 3B Hi-Speed Plain
K & T 2H Plain
K & T 3H
K & T 5H Plain
K & T 2HL Swivel Hd. Vert.
VAN NORMAN #12 Tool Room
VAN NORMAN #22L Plain
VAN NORMAN #22LU Univ.

MILLERS, PRODUCTION
CINN. #08 Plain
CINN. #08 Vert.
CINN. #2—18 R & F Cam Roller
CINN. #4-36 Hydromatic, 2-way Cycle

MISCELLANEOUS
GRAY 36"x36"x12' Double Housing Planer—1942
INGERSOLL 42"x42"x14' Double Housing, Adj. Rail
Planer Type Milling Machine, 4 Heads, 1940
LaPOINTE HP 5 2½ Ton Hor. Hydr. Broach, 1947

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LATHES

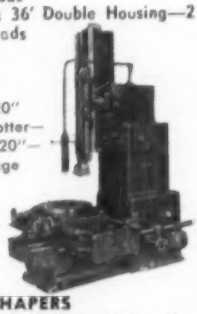
Lodge & Shipley 14" x 30" cc Selective Geared Head—Speeds to 540 RPM
Pratt & Whitney 14" x 30" cc Model C Geared Head—Speeds to 1000 RPM
Hendey 16" x 30" cc Geared Head—Speeds to 10000 RPM—Taper attachment—1941
Nebel 18" x 54" cc Geared Head Model LN—Speeds to 400 RPM—1951
Springfield 20" x 128" cc Geared Head—Speeds to 423 RPM—1947
American 24" x 48" cc High Duty Geared Head—Speeds to 450 RPM—Taper attachment
Lehman 36" x 186" cc Extra Heavy Duty Hydratrol—Speeds to 251 RPM

MILLERS

Cincinnati #2 Plain Dial Type — Range 28" x 19"—Speeds to 500 RPM
Milwaukee #3H Plain Dial Type—Range 34" x 12" x 17"—Speeds to 1000 RPM—1940
Cincinnati #4 Plain Dial Type—Range 42" x 14" x 20"—Speeds to 450 RPM—1942
Cincinnati #5 Plain High Power—Range 50" x 14" x 21"—Speeds to 443 RPM—1942
Cincinnati #34-36 Duplex Hydromatic—Speeds to 200 RPM—1939
Cincinnati #5-48 Plain Hydromatic——Speeds to 127 RPM
Brown & Sharpe #2A Universal Dual Control—Range 28" x 10" x 17"—Speeds to 1200 RPM
Milwaukee #2K Universal Dial Type—Range 28" x 10" x 17"—Speeds to 1500 RPM
Cincinnati #4 Vertical Dial Type—Range 42" x 16" x 16"—Speeds to 1300 RPM

PLANERS

Gray 42" x 42" x 24' Double Housing—2 rail, 2 side heads
Betts 15' x 10' x 36' Double Housing—2 rail, 2 side heads



Rockford 20" Hy-Draulic Slotter—Stroke, max. 20"—1952 vintage

SHAPERS

Gemco 24" Standard Duty Universal—Strokes per min. to 130—Vise
Hendey 24" Back Geared Heavy Duty—Power down feed to head—Vise

SLOTTERS

Pratt & Whitney 6" and 12" Model B

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GEAR EQUIPMENT—Fellows

FELLOWS No. 6 gear shaper; M.D. late
FELLOWS No. 4T Thread Generator; 4"x18"; late
FELLOWS No. 61A High Speed Gear Shaper; cap. 18" late type
FELLOWS No. 6Z2 High Speed Gear Shaper; late
FELLOWS No. 612 High Speed Gear Shaper; late
FELLOWS No. 624A High Speed Gear Shaper; late
FELLOWS No. 645-A Gear Shaper; late type
FELLOWS type 645-A3 High Speed Gear Shaper
FELLOWS No. 7 High Speed Gear Shaper; late
FELLOWS No. 7A High Speed Gear Shaper; late
FELLOWS No. 72 High Speed Gear Shaper; late
FELLOWS No. 75 High Speed Gear Shaper; late
FELLOWS No. 715 High Speed Gear Shaper; late
FELLOWS No. 7125 High Speed Gear Shaper; late
FELLOWS No. 77 Gear Shaper; late type
FELLOWS No. 13LB Lapper; late type
FELLOWS 4-T Thread Generator; 4"x12" table; late type
FELLOWS #24 Involute Measuring Machine; latest type

GEAR EQUIPMENT—Gleason

GLEASON No. 1 Flame Hardener; late type
GLEASON 5" Spiral Gear Generator; late
GLEASON 3" Straight Bevel Gear Gen. late
GLEASON No. 6 Revacycle; late type
GLEASON No. 7 Hyp. Cutter Sharpener
GLEASON No. 12 Tool Sharpener; late
GLEASON 12" Straight Bevel Generator; for Roughing & Finishing; late type
GLEASON No. 12 Straight bevel gear Roughor; M.D.; late type
GLEASON No. 12B "Coniflex" Gear Generator; late type
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 15" spiral bevel, cutter sharpener; M.D.
GLEASON No. 14 Spiral & Bevel Hypoid Gear Grinder; M.D.
GLEASON 15" Spiral Bevel Inisher
GLEASON No. 15 Quenching Press; late
GLEASON 25" Quenching Press; late type
GLEASON No. 18 Gear Tester & Lapper; M.D.
GLEASON 24" Bevel Gear Planer; M.D.

GEAR EQUIPMENT (MISCELLANEOUS)

BARBER COLMAN Type "A" with differential; late type
BARBER COLMAN Type "S" Hobber; late
BARBER COLMAN No. 3 Precision type and Standard type Gear Hobber; late
BARBER COLMAN Model "Y" Gear Hobber; late
BARBER COLMAN #12 Gear Hobber; M.D.
BILGRAM 6" and 16" Bevel Generator; M.D.
BROWN & SHARPE No. 14 Auto. Gear Cutter
CINCIN. No. 4 (36"x12") Gear Cutter
CINCIN. No. 6-A (72"x20") Gear Cutter
CINCIN. No. 7-A (84"x24") Gear Cutter
CROSS No. 1 Gear Tooth Rounder; M.D.
CROSS No. 40 Gear Tooth Rounder; M.D.
CROSS No. 45 Gear Tooth Rounder; late
GOULD & EBERHARDT type 8H Universal Mfg. Gear Hobber; late type
GOULD & EBERHARDT type 12H Universal Mfg. Hobber; late type
GOULD & EBERHARDT No. 24H Universal Gear Hobber; late type
GOULD & EBERHARDT No. 36BT 4 spindle Bevel Gear Rougher; motor drive
KOEPFER Model WM-11 Auto. Gear Hobber; late type
PARKSON 9" Gear Tester; late type
PFAUTER #0 Univ. Gear Hobber; late
PRATT & WHITNEY 10" Gear Grinder; Single or Double Wheel; late type
ROBEY SMITH No. 1 Bevel Gear Planing

GRINDERS—SURFACE

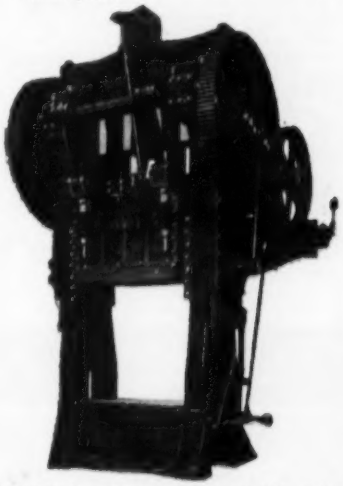
ABRASIVE 1½ hand surface grinder; late
ABA 8"x24" Prec. Hydr. Grinder; late type
BILLITER & KLUNZ 48"x186" Way Grinder
BLANCHARD No. 11 Rotary; cap. 36" dia. M.D.
BROWN & SHARPE No. 2; motor drive; late
BROWN & SHARPE No. 2; NEW
HANCHETT 36"x120" Wheel Grinder; late
HEALD No. 22 Rotary; 12" chuck; M.D.
HEALD No. 25A Rotary; 30" Chuck; late
HEALD No. 261 Rotary Surface Grinder; 12" chuck; latest type
MATTISON 14"x10"x60" Hydraulic Surface Grinder; late type
MATTISON 14"x24"x72" Rotary late type
MATTISON 10"x24"x120" High Power; late type
NORTON 6"x18" Vertical and Horizontal; late
PRATT & WHITNEY "B" 14"x36" Vert.; late

GRINDERS—Thread

EX-CELL-O No. 33 Thread Grinder; late
EX-CELL-O No. 35L 60" centers; late type
LANDIS No. 6 Precision; late type

LATHES—Turret

GISHOLT 1L Univ. Saddle type; Timken; late
GISHOLT 2L Univ. Timken; late type
GISHOLT No. 3 Univ. M.D.; late type
GISHOLT No. 5 pre-selector head; late
LIBBY 4H-12; 12" hole; M.D.; late type
MOREY No. 2 ram type, Timken; latest type
MOREY No. 4 Univ. ram type; latest type
POTTER & JOHNSTON No. 5DT Automatic Chucking & turning; late type
WARNER & SWASEY No. 1 Electric; late
WARNER & SWASEY No. 1A Universal; for chucking work



BLISS No. 410A, 525-ton double action Toggle drawing press; with or without cushions; M.D.

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WARNER & SWASEY No. 2A Universal, for chucking; M.D.; late type
WARNER & SWASEY No. 4 Univ., pre-selector head; late type
WARNER & SWASEY No. 4-A; Univ. 9" hole; latest type

MILLING MACHINES

BROWN & SHARPE No. 2 "Light Type," PRT, Timken; late type
BROWN & SHARPE No. 12 electrically controlled; late type
CINCINNATI 2-24 Automatic; Timken; M.D.
CINCINNATI 2-24 Hydr. rise and fall; Timken
CINCINNATI No. 4 High Power; Dial Type; High Speed; M.D.; New 1952
CINCINNATI No. 5-48 tracer controlled; Hydr.; late
KEARNEY & TRECKER (Milwaukee) No. 2H; Timken Bearing; late type
KENT OWENS; table 22"x8"; M.D.; late
ROCKFORD No. 3 "Rigidmil"; motor drive
STARR No. 2 Table 13"x55", late type
SUNDSTRAND No. 33 Plain; late type

MILLING MACHINES—Vertical

BRIDGEPORT ½ H.P.; table 9"x36"
BROWN & SHARPE No. 2 Light Type Vert.
CINCINNATI 0-B Vertical, Timken; late
CINCINNATI No. 2M Vertical; late type
CINCINNATI No. 5; dial type; high speed or medium speed; Timken; late type
KEARNEY & TRECKER "Milwaukee" Model 2KM Timken; latest type
KEARNEY & TRECKER "Milwaukee" Model 4H Timken; late
KEARNEY & TRECKER (Milwaukee) No. 4K high speed Timken; power rapid traverse; M.D.
REED PRENTICE No. 5 PRT; Timken; late

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No. 1B Milwaukee, m.d.
No. 2 Cincinnati Plain H.S. Dial Type, m.d.
No. 2B Brown & Sharpe, m.d.
No. 3B Brown & Sharpe, m.d.
No. 3B Milwaukee, m.d.
No. 4B Brown & Sharpe Plain, m.d.
No. 3 Cincinnati Plain H.P., Dial Type, m.d.
No. 5 Cincinnati Plain H.P., m.d., late
No. 22L Van Norman Ram Type Swivel Head, m.d.
No. 2LP Van Norman, m.d.

THREAD MILLING MACHINES

12x24" centers Lees Bradner Model HT, Heavy Duty, m.d.
12x36" Lees-Bradner Universal Type, m.d.
12x54" Lees-Bradner Universal Type, m.d.
12x102" Lees-Bradner Universal Type, m.d.
14"x16" U6 Automatic Hob, m.d.
No. 40 Lees-Bradner Automatic Universal, m.d., late
Hall Planetary, m.d.
Model B Hall Planetary, m.d.
Model C Hall Planetary, m.d.
Moorhey Planetary, m.d.

VERTICAL MILLING MACHINES

No. 1-14 Kent Owens, m.d.
No. 00 Cincinnati, m.d., latest
54" Ingersoll Single Spindle Adjustable Rotary Mill, m.d.
54" Ingersoll two spindle Rotary Mill, m.d.
No. 4 Cincinnati Vertical High Power, m.d.
No. 3K Kearney & Trecker "Milwaukee", m.d.

MANUFACTURING TYPE MILLING MACHINES

No. MM-1-6 U.S. Multi-Miller, m.d.
24" Cincinnati Plain Automatic, m.d.
24" Cincinnati Duplex Automatic, m.d.
No. 21 Brown & Sharpe Automatic, m.d.
48"x16" Newton Slab Miller, m.d.
48" Cincinnati Auto. Duplex Production Mill, m.d.
54"x30"x16' Ingersoll Slab Miller, m.d.
No. 1-18 Cincinnati Plain Automatic
M80 Taylor & Fenn Duplex Spline Miller, m.d., latest type
Model 1402 Kearney & Trecker Simplex, m.d.
No. 33 Simplex Production Miller, m.d.

PROFILERS

No. 12B Pratt & Whitney Model 1693, 2 spindle, 1944
No. 12M Morey 2 spindle, m.d.
4 spindle 360° Cincinnati Automatic, m.d., 1944

SLOTTERS

10" Newton, m.d.
18" Betts, m.d.
18" Niles-Bement, c.p.d.
20-24" Pattern Dill, m.d.
22" Betts, m.d.
48" Niles, m.d.

PLANERS

P10 Coulter Crank Type Shaper-Planer, m.d., 1 head
30"x30"x10' Cincinnati, belted m.d., 2 heads
36" widened to 36"x30"x8' Gray, belt drive
36"x36"x8' Cincinnati, m.d., 2 heads on rail
36"x36"x12' Betts, m.d., 2 heads
36"x36"x12' G. A. Gray, 3 heads
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' G. A. Gray Extra Heavy, belt, 2 heads on rail
36" widened to 42"x36"x20' Cincinnati, m.d., 2 rail heads, 1 side head
36"x36"x30' Cincinnati, m.d., 4 heads
42"x24"x16' Cincinnati Hypro Extra Heavy Frog & Switch
42"x42"x26' G. A. Gray, 2 heads, belted motor drive
48"x48"x12' Cincinnati, 4 heads
48"x48"x18' Niles-Bement-Pond, 2 heads, belt
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, reversing m.d., 4 heads
56"x42"x14' Cincinnati, belted m.d., 2 heads
72"x72"x28' table Niles Double Housing, m.d.

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No. 2 Niles-Bement-Pond Axle Lathe, m.d.
32" Betts Car Wheel Borer
90" Niles Balanced Quartering & Crank Pin Turning Machine, latest
90" Niles Journal Turning Locomotive Lathe, including 2 inside Journal Turrets and 3½" spindle double quartering Attach., m.d.
90" Niles Driving Wheel Lathe, m.d., latest
No. 3 Betts Bridgeford Axle Lathe, m.d.

SHAPERS

No. 14 Cochran Bly Vertical Shaper, m.d.
6" Pratt & Whitney M1506, Model B Vertical Shaper
16" Smith & Mills Universal, m.d.
24" Hendey Back Geared Crank Shaper, m.d.
24" Potter & Johnston, cone
32" Morton Draw-Cut, m.d., late
32" Ohio Shaper, m.d.
32" Cincinnati, m.d., late
32" Columbia H.D. Plain Back Geared Crank Shaper, m.d.
36" Morton Draw-Cut, m.d., late
36" Rockford Universal Openside Shaper Planer, m.d.
38" Morton Draw-Cut Shaper

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Late Type No. 2 Cincinnati Dial Type Universal High Speed Miller Serial 4A2U1P-55

48" x 48" x 12' Cleveland Heavy Duty Openside Planer

#300 Hanchett Vertical Surface Grinder Serial #300-17.

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No. 2 Standard Brown & Sharpe vertical mill, new 1943.
No. 3 Gisholt ram type universal turret lathes (2), new 1942.
No. 5 Gisholt ram type universal turret lathe, new 1940. Arr. bar & chucking.
Models BL2416-BL3616 F & W Keller machines (3) one late
14" x 42" cc Hendey toolroom engine lathe, new 1940.
No. 5-48 Cincinnati hydromatic duplex mill, late
No. 4 Cincinnati high-power plain horizontal mill, serial E506J.
No. 4 Gallmeyer & Livingstone universal tool & cutter grinder, new 1941.
5' arm 13" col. Fosdick "Economax" hydraulic radial drill, new 1943.

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4 DE POTTER & JOHNSTON Automatic Turret Lathe, Late Type.

27" x 18' MONARCH "N" Geared Head Lathe, 11' Centers, Taper Attachment, Full Equipment. Late Type. 1942.

24" x 36" BULLARD Vertical Turret Lathe, Turret Hd., Side Hd., M.D.

No. 2, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No. 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Chucking. Late Type.

17" x 8' LeBlond Regal Grd. Hd. Lathe, M.D.

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28" BARNES Upright Drill Press No. 242 M.D. Box Column, Power Feed.

3', 4', 5', 6' CINCINNATI BICKFORD Radial Drills.

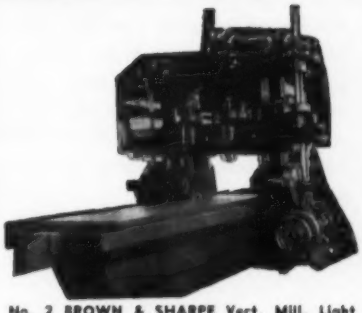
6 Spindle No. 2 LMS Leland-Gifford Drill Press. Late Type.

No. 2 M. T. Six Spindle ALLEN Type KH Drill Press. Individual Motor Drive. Late Type.

MILLS

No. 2HL Kearney & Trecker Horiz. Mill, M.D., Late Type

1A PRATT & WHITNEY Jig Borer, with Gauges, Rods, Collets and Chuck.



No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D. Late.

42" by 36" x 12" INGERSOLL Planer Type Mill, two heads on rail, two side heads, M.D.

No. 28-60 CINCINNATI Vertical Hydro-Tel Mill 2 Spindle and Tracer Spindle.

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No. 6 BLISS Straight Side Press Double Crank 135 Tons Cap., Motor Drives.

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GRINDERS

No. 13 BROWN & SHARPE Universal Tool & Cutter Grinder, Complete Tooling.

4' x 12' LANDIS Hydraulic Plain Cylindrical Grinder, M.D. Late Type.

6" x 18" NORTON Hydraulic Horizontal Surface Grinder, Permanent Magnetic Chuck, Coolant System, Late Type.

No. 14 W HAMMOND Double End Carbide Grinder, M.D.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4T SELLERS Tool Grinder, M.D. Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

6" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

MISCELLANEOUS

18 KW SCIENTIFIC ELECTRIC Induction Heater, Tube Type.

No. 8LS FELLOWS M.D. Gear Lapping Machine, Detachable Head, Univ. Work Support.

No. 1, 2, BUFFALO FORGE Vertical Angle Bending Rolls, M.D.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

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10' x ¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

No. 194 BARNES Vertical Hone, 4" Capacity, 12" Stroke, M.D.

12" PRATT & WHITNEY Vertical Shaper, Keller Attachment. Late Type.

12" ROCKFORD Hydraulic Vertical Shaper. 1953.

14" Jones & Lamson Comparator, Late Type.

15' x 10' x 36' BETTS Double Housing Planer, 4 Swivel Heads, Pendant Control, Box Table, Motor Driven.

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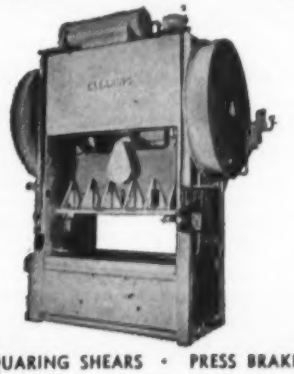

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BORING MACHINES

Foote-Burt Vert. 20" sw, new 1941
#49 Heald Borematic, new 1944

DRILLS

1 spdl, 14" sw, #3 Avey, new 1945
1 spdl, 20" sw #2LM8 L.-G., 1945
1 spdl, 24" sw, #2MA6 Avey, new 1942
1 spdl, 26" sw, #4M8 L-G, hydraulic
2 spdl, 24" sw, #3 Avey, AC MD
3 spdl, 20" sw, #2LM8 L.-G, 1942
3 spdl, 24" sw, #3M8 L-G, new 1942
4 spdl, 14" sw, #2LM8 L-G, new 1942
6 spdl, 20" sw, #1LM8 L-G, new 1943
#314-A Baker Univ. H.D., 1943
16 spdl. Fox #K60H, #3 taper, 1944

BORING MACHINES

Foote-Burt Vert. 20" sw, new 1941
#49 Heald Borematic, new 1944

GRINDERS

3"x12" #5 B&W, Rap. Trav., 1943
3"x18" #5 B&W, Rap. Trav. 1943
4"x18" No. 4H Landis 1943
6"x18" Norton Type C, new 1943
10"x18" Norton Type C, new 1943
10"x36" Norton Type C, new 1942
10"x48" Norton Type C, new 1943
10" (28" sw.) x 48" Cinc. ER, 1943
10"x50" Hill-Clarke, AC Mot. Dr.
10"x72" Hill-Clarke, AC Mot. Dr.
10"x96" Hill-Clarke, AC Mot. Dr.
10"-20"x96" Norton, angular wheel
14"x72" Norton Type C, new 1941.
16"x72" Hill-Clarke, AC Mot. Dr.
16"x26"x72" Norton, AC MD, 1941
42"x72" Norton, extras, new 1947
18"x96" Hill-Clarke, AC Mot. Dr.
18"x120" Norton, AC MD.
24"x264" Norton, AC MD, Rebuilt
26"-32" Gap x 114" Norton Pl. Cyl.
#5A Bryant Internal, new 1943
#16A-16 Bryant Internal, new 1943
#16-26 Bryant Internal, new 1941
#24-26 Bryant Internal, new 1941
#24-36 Bryant Internal, new 1941
#72A3 Heald Int. Sizematic, 1944
#72A5 Heald Internal, new 1943
#72A5 Heald Bridge Type Int.
#314 Besly Double End Disc. 1940
#3-R Abrasive Surf. 8"x24", 1943
#18-30" Blanchard Rot. Surf.

LATHES

18ML-16"x36" LeBlond Auto.
#16ML-16 LeBlond, Semi-Auto, 36" cc
12"x36" Hendey Lathe, Taper Att.
12"x28" Lips Carbc Semi-Auto
12"x32" Fay Automatic
12"x45" Fay Automatic
14"x36" Amer. Grd. Hd., MD
27"x84" Amer. Grd. Hd., MD
24"x42" Fay Auto. AC MD
36"x126" Putnam Grd. Hd., MD
R14 Seneca Falls, 16"x36", 1943
120"x96" cc N-B-P, ser. 9360
#5W Cinc Acme Univ. Turret
#4 Gisholt Univ. Tur. A.C.&B.F.
#3H-10 Libby H.D. Tur. 1943
#4A W&S Turret, new 1944
4FU Pasternacke, tur. 33" sw, 1944
#8D Potter & Johnston, new 1941

MILLERS

54"x20"x16 Ingersoll Slab, 1934
54"x8' Ingersoll Openside, 1942
54" Ingersoll Vertical Rot.
#M-24 K&T Prod. 1941
#0V Davis & Thompson Vert., 1944
2½" Bar Cinc.-Gilbert Table Type HBM
#12-B Pratt & Whitney Profilers
10"x60" P&W Mod. B Thread Mill
#LT 6"x72" L B Thread
#CT L-B Thread Mill new 1942
No. 2 Cinc. Univ. Hi-Power
#26 Van Norman, Rebuilt, 1941
#1-18 Van Norman Prod. 1942
1648-S K&T Simplex

PLANERS

36"x36"x12' Rockford Openside '42
60"x48"x27' American, 4 hds.
60"x48"x30' Hamilton, 4 heads

MISCELLANEOUS

6" Goss & DeLeeuw 8 spdls. 1941
#306 Barnes Vert. Hone, new 1942
15 Ton Hyd American Press, 1946
#11HD 2 Hd. W&S Tapper, latest
#36BM G&E 3 Spdl. Bevel Gear
#61A Fellows Gr Shaper 18" cam
#HMS Barber-Colman Sharp Mach
15 T Toledo Overhead Crane, 39¼

HILL-CLARKE
MACHINERY COMPANY 2106 S. KILBOURN AVE., CHICAGO 23, ILL.
PHONE: CRawford 7-2000

New "SEARCHLIGHT" Advertisements

received by 10 A. M. in the N.Y.C. office, Oct. 23rd, will appear in the Nov. 5 issue, subject to space limitations.

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New Britain Model 16 Auto. Chucker 6-Sp.
Bridgeport Vert. Miller with Shaping Attach
Brown & Sharpe No. 2 Surf. Grinder All Motorized
G&L 3" Bar Table Type Horiz. Boring Mill
Colburn 2-Spindle Box Col. Heavy Drill M.D. 20"
Niles (Timesaver Model) 32"x14' Bed Grd. Hd. M.D. Lathe 7' Centers.
Niagara 4' Power Shear ½" Cap. 20" Gap
Ohio 24" M.D. All Grd. Feeds Shaper 1942 model
Cincinnati No. 5 Rect. Overarm Grd. Hd. Plain Horiz. Miller.
Baush 44" Vert. Boring Mill 2 heads.
American Vert. Hyd. Broach 48" str. 15 ton cap. 1947
American 20"x8' Grd. Hd. Lathe motor in base.
Landis 20"x72" and 18"x96" Plain xt. Grinder.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table
W&S No. 2-A Grd. Hd. Univ. Turret Lathe
Bliss 200 T Cap. S.S.S.C.B. Grd. Press 8" Str. #77
Rivett No. 104 A.C. M.D. Internal Grinder, 1942.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers.
DoAll 16" Job Selector Metal Saw. 1950 Model.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box
Amer. 6' Radial Excl. Hd. 16" Col. 32-Sp. Speeds.
Amer. 4 Radial 12" Col. Excl. Hd.
Bliss #6N S.G. Stiltz Type Press
Cincinnati No. 2 HI-Power S.P.D. Vert. Miller.
B&S #2A Grd. Hd. Horiz. Univ. Miller.
Barnes 20" All Grd. Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf. Grinder 26" chuck.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Ref. Surf. Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Belt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
P & J #2 Auto. Prod. Miller, 2 Tables.
Cincinnati #2, #3 & #4 Centerless Grinders, all Motor Driven, Bullard 24" Vert. Turret Lathe. Lynd-Farquhar 26" stroke open-side Shaper Planer.

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52" King & 84" Sellers
4" & 3½" Bar Landis, Floor Type (2)
3" Bar Universal Tblo. Type, Triway
GRINDERS, 60" Hanchett Vert. Spin., No. 500 Hyd., Surf.
Nos. 2B Reid, 3B Abrasive, Surf.
36"x42" Pratt & Whitney Die & Surf.
30"x120" Hanchett Plano, Surf.
16"x96" Cinci. Plain Cyl.
LATHES, 25"x192" Con. Lehmann, T.A.
18"x48" con. Monarch, '42
20"x54" con. Reed Prentice '43
TURRETS No. 2H10 Libby 10¾", '43
Nos. 5 & 3 B. & O. '43
No. 3 Gisholt, Bar Chuck, '42
ROLLS, 10'x¾" Bertsch Pinch '43
SHAPER, VERT., 12" Pratt & Whitney, 1942
SLOTTER, 36" Rockford, Hyd., '44

375 Allwood Rd., Clifton, New Jersey
Phone PRescott 9-8996 N. Y. Phone LOngacre 3-1222

PRACTICALLY NEW PRESSES

Warco #290-2-72 Cap. 250 ton Bed 42" x 72"
Minster No. 50-7-72, cap. 200 tons, Bed 72"x50"
Bliss-Toledo No. 93½J, cap. 140 tons, Bed 108"x48"
Bliss-Toledo No. 93½H, cap. 140 tons, Bed 84"x48"
Bliss No. 5-40 Double Action Toggle Draw Press, Strokes 20" and 31". Will draw and lift out 15", Bed 40"x40"

All Machines have Air Clutch and some have Air Cushions and Motor Driven Ram Adjustment. Still set up in Plant

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*Chucker—#675 New Britain 2½"—6 Spdl Appr '40
*Grinder—#10A-2 Blanchard Autom Surf '48
*Induction Heating Unit—75 KW Tocco, 3 Sta '44
*Lathe—20x84 Sidney H.D. 32 speed T.R. Mod '52
*Lapper—Cinc Centerless, Filamatic '51
*Mill—#2 B&S Horiz w/vert head, 3 HP '48
—#2M K&T Vert. Miller Slides, 5 HP '42
*Press—150 Ton #9½ Verson OBI w/cush. '45
802 HPM inj. Moulding, New Controls
*Shaper—36" Rockford Openside, Side & Rail Heads '43
*Thread Mill—GT-56 Lees Bradner Univ. new condition

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24" High Column Spiral Drive BULLARD Vertical Turret Lathe

DRILLS

No. 2 MA 6 AVEY, 15" overhang, large table
No. 3B Eclund, 12" overhang

GEAR CUTTERS & HOBBERS

No. 61 FELLOWS Gear Shaper (older)
No. 61A FELLOWS Gear Shaper (late)
No. 36BM GOULD & EBERHARDT 3-spindle Bevel Gear Cutter
No. 36B GOULD & EBERHARDT Automatic Gear Cutter (late)
No. 725 FELLOWS High Speed Gear Shaper
No. 12 GLEASON Straight Bevel Gear Rougher
No. 60SM GOULD & EBERHARDT 3-spindle Vertical Gear Cutter (nearly new)

GRINDERS

No. 13 BROWN & SHARPE Grinder
No. 5 BRYANT Internal Hydraulic Hole Grinder (late)
16-28 BRYANT Hydraulic Internal Hole Grinder (late)
No. 16-38 BRYANT Internal Hydraulic Hole Grinder (late)
No. 24P26 BRYANT Hydraulic Internal Hole Grinder (late)
No. 50 HEALD Internal Grinder (late)
6"x18" CINCINNATI Plain Cylindrical Grinder Type EA, saddle (rebuilt and ready)
10"x48" LANDIS Plain Cylindrical Type C Grinder (late)
14"x72" Plain CINCINNATI Self-contained Grinder
14"x168" LANDIS type CH Plain Cylindrical Grinder (late)
16"x36" NORTON Type C (plunge) Cylindrical Grinder (late)
Model A3-16 ARTER Rotary Surface Grinder
No. 16A2 BLANCHARD Automatic Surface Grinder (excellent)
Model 76 RAP ROGERS Knife Grinder

MILLERS

No. 4F K & T Plain Mill Motor-in-base Timken Spindle
No. 4-48 CINCINNATI Hydro-Matic Duplex Mill

PLANERS

36"x36"x26' CINCINNATI Double Housing Hypro Planer (reversing motor drive)

TURRET LATHES

No. 5 GISHOLT Ram Type Hydraulic Pre-selector (late)
No. 1 CINCINNATI ACME Heavy Duty (good)
No. 1A WARNER & SWASEY Geared Head Way Type (older)
No. 2A WARNER & SWASEY Geared Head Way Type (older)
No. 2A WARNER & SWASEY Geared Head Way Type Serial 900,000 (1946)

MISCELLANEOUS

14"x16' COULTER Automatic Screw Cutting Lathe (late type)
12" 8-Spindle BULLARD Mult-Au-Matic
6"x60" MODEL C PRATT & WHITNEY Thread Mill (rebuilt and ready)
No. 22 MURCHEY Single Head Threader (practically new)
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CINN 5-60 Prod. Mill 1944
K&T 1404 Prod. Mill 1943
CINN 1-18 Prod. Mill 1951
SUNDSTRAND #1 Rigidmil 1954
TOCCO 200 KW, 3,000 cy. 1943
TOCCO 80 KW, 10,000 cy. 1943
WARNER & SWASEY #3 Air Chuck & cyl.
GISHOLT #3, Air Chuck & Cyl. 1943

GISHOLT 1L, bar feed, C.B. turret, 1943
BULLARD 42", VTL Side Head
LAPOINTE, Vert. Broach 20T, 90" st. 1941
CINN. Cyl. Grinder 6x18 Plunge 1945
CINN. Cyl. Grinder, 10x18 Plunge 1941
CINN. Cyl. Grinder, 16x72 Plunge 1943
NORTON Cyl. Grinder, 6x18 Plunge 1944
HANCHETT #900 Face Grinder 1944
ROCKFORD Hyd. Vert. Shaper, 20" st. 1944
GRAY DH Planer, 60x60x12, 4 heads, DC drive
BETTS DH Planer, 84x84x16, 4 heads DC drive
SOMMER & ADAMS Thread Mill, 18", H.I.S. 1943
BIGNALL & KEELER 8" pipe threader, 1949
BIGNALL & KEELER 12" pipe threader, 1949
BLISS 312 W, SSSC, 665 Te, 14" stroke, 43"x50" bed, 1947

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*WHERE **BIG** THINGS ARE HAPPENING **TODAY!***

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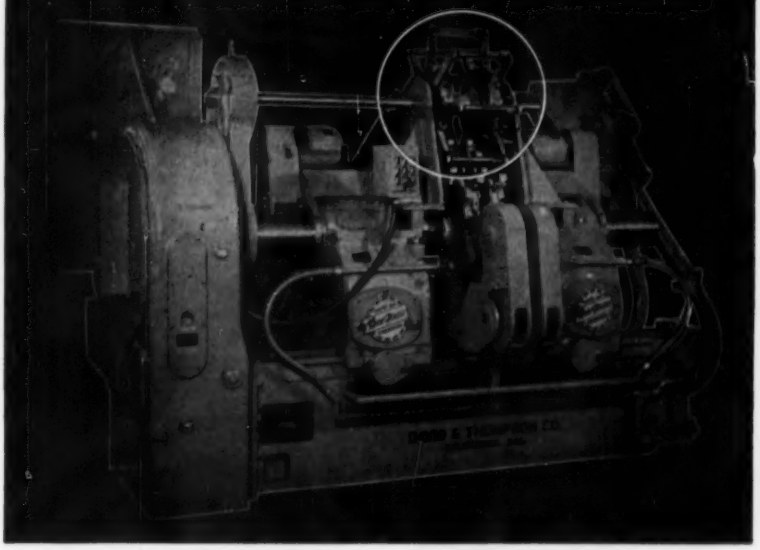
. . . Milling and Centering Steering Gear Shafts at the Rate of 360 Per Hour



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Davis and Thompson Co.

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SET SCREWS • MILLED STUDS
. . . our specialty.

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Write for Bulletin L-14

Describes L&J O.B.I. Presses. 23 Models, 14 to 90 tons, geared and non-geared. Also, 20 to 50 ton Double Crank, High Speed, Straight Side Presses.

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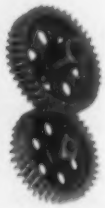

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SPROCKETS
Write or wire for quotations

30 years experience making custom cut gears!

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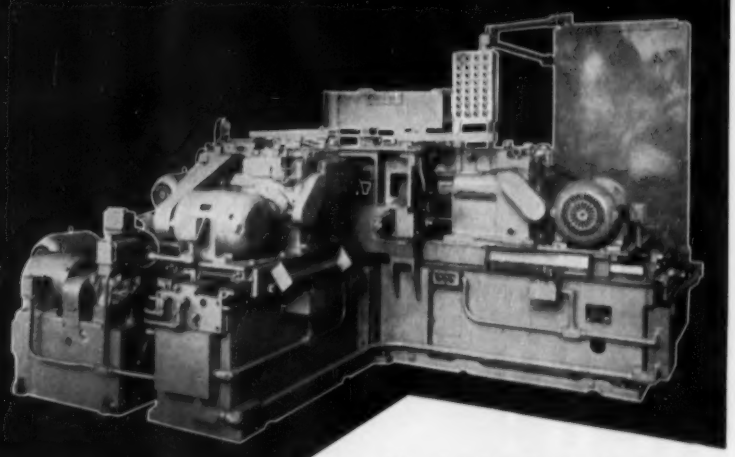

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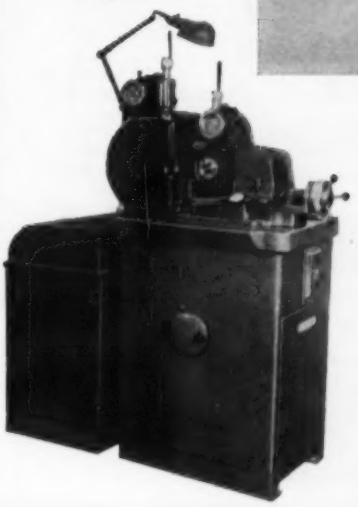

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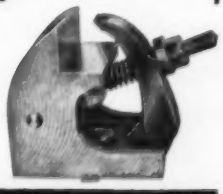

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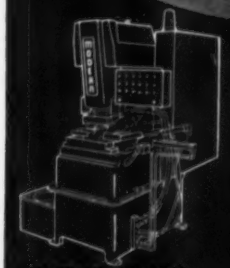

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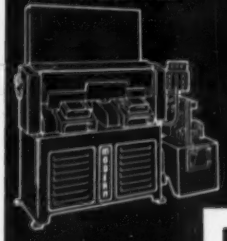

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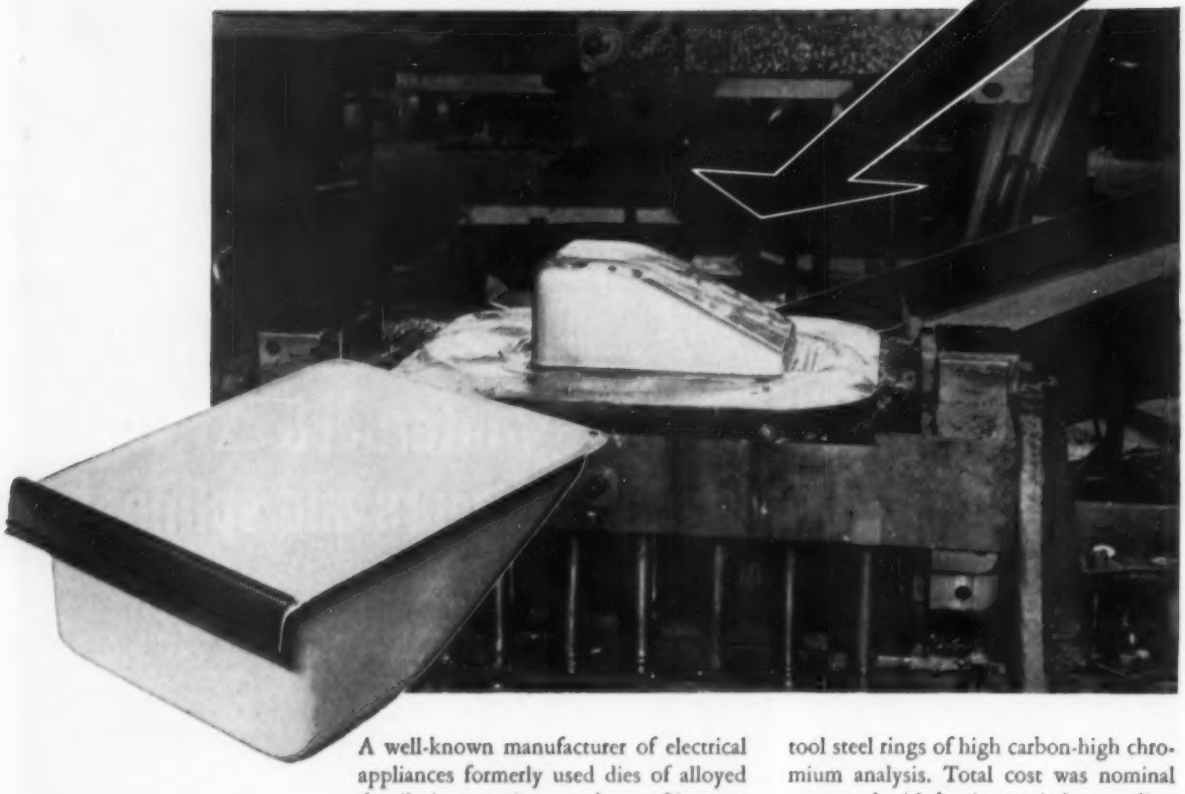

A well-known manufacturer of electrical appliances formerly used dies of alloyed ductile iron castings to draw refrigerator crisper pans.

These dies had to be redressed after every 10,000 pieces (approximate cost: $1300 each) and had to be replaced after every 30,000 pieces. 8 to 10% of the pans were scrapped due to defects.

Because of this scrap problem and the severity of the draw—a 52% reduction of the steel—it was decided to rebuild the dies using a suitable grade of tool steel.

A 2" cut was taken off the top of the old cavity and the draw ring. These cuts were replaced with A-L Cast-to-Shape tool steel rings of high carbon-high chromium analysis. Total cost was nominal compared with buying entirely new dies.

Each of the revised dies has produced approximately 500,000 pans. Their condition indicates that probably *twice* that many can be drawn before the dies must be redressed. Defective pieces have been reduced to a mere 1½ to 2%—*an 80% reduction!*

● Ask your A-L representative TODAY how Cast-to-Shape tool steel can help solve your production problems . . . or write *Allegheny Ludlum Steel Corporation, Forging and Casting Division, Detroit 20, Mich.*

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